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ARCHIVES OF OPHTHALMOLOGY.

THE EARLY DEVELOPMENT OF THE CORNEAL TUBERCLE. (A STUDY IN SLIT LAMP MICROSCOPY.)

BY DRS. BERTHA T. HAESSLER AND F. HERBERT HAESSLER.

(From the Henry Phipps Institute of the University of Pennsylvania, Philadelphia.)

EXPERIMENTAL tuberculosis of the cornea has been studied repeatedly and both the gross and microscopical appearances of the lesions have been accurately described. In 1877 Cohnheim and Salomonson (1) inoculated tuberculous matter into the anterior chamber and called attention to tuberculosis of the iris and cornea. Haensell (2) in 1879 inoculated the pus from tuberculous joints into the cornea of rabbits and guinea pigs, and describes the gross and microscopic appearance of the lesions which, in his cases, all went on to complete healing. Panas and Vassaux (3), in 1885, likewise gave an accurate picture of tuberculosis of the cornea with healing, gross and microscopic. They passed tuberculous sputum through guinea pigs and used the ground-up tubercle, which was introduced into the cornea with a vaccine stylet. Kostenitsch and Wolkow (4), in 1892, used pure cultures of the tubercle bacillus for the study of experimental tuberculosis of the cornea, anterior chamber, and vitreous. Their work is almost entirely a histological study of the cellular reactions to the tubercle bacillus. In 1896, Heydemann (5) published an

extensive dissertation on tuberculosis of the cornea with a thorough review of the literature on the development of the tubercle. He described both gross and microscopic changes. The first reaction was observed to occur at the end of ten to fourteen days, and healing eventually took place in all cases. Schieck (6), in 1896, gave a detailed and interesting account of the first stages of experimental tuberculosis of the cornea of the rabbit, as observed in microscopic sections, with an introductory discussion of the literature. Bach (7) likewise described tuberculosis of the cornea both clinically and experimentally, and found that if a deep corneal inoculation was made, tubercles developed more slowly than after superficial inoculation. He saw a secondary involvement of the iris in only one instance. Krusius (8), in 1911, did considerable work on experimental tuberculosis of the eye. He attempted to obtain quantitatively comparable results by using large series of similar animals, with one culture of constant virulence. The quantity of organisms was standardized by emulsifying dry bacilli in salt solution and making dilutions with large differences made of the same emulsion. He inoculated his emulsions into the corneal substance, and used a corneal microscope as an aid to his observations. He concluded that the incubation period in a given case is inversely proportional to the quantity of the infection, with an upper limit at which the incubation period equals zero and a lower limit where it equals infinity. He states that only in the rarest cases do the bacilli enter the general circulation. He found, by using quantitative inoculations, that the susceptibility of the eye to tuberculosis was, decreasingly as follows: vitreous (most susceptible), aqueous, cornea, conjunctiva, and lens. Krusius, as well as all the other workers here quoted, obtained healing in practically all the cases studied.

Lewis and Montgomery (9), 1914, published a paper entitled "Experimental Tuberculosis of the Cornea," and it is on this work that the present study is based. Our study was undertaken at the suggestion of Dr. Lewis with the idea that something might be added to the observations of the gross development of the tubercle by the aid of the corneal microscope with slit lamp illumination. The technique of inoculation is that described by Lewis and Montgomery, namely, injection into

the corneal stroma of an emulsion of tubercle bacilli by means of a small record syringe and a number 26 platinum needle with a very short bevel and a sharp point. Rabbits were used exclusively and the eyes were well cocainized before inoculation. Grossly the lesions developed as described by Lewis and except where a known avirulent organism was used, healing at no time occurred. The animal eventually succumbed to a generalized tuberculosis. Emulsions made of pure cultures of bovine strains of known virulence were used in all cases.

In the majority of the animals our studies were limited to the early changes—those occurring during the first, second, or third weeks after inoculation—as we found that it was here that the slit lamp and corneal microscope were of the greatest help.

The Gullstrand slit lamp is an instrument that has increased the field of usefulness of the microscope for observing the living eye, not because its light is more intense but because it is corrected so that only a narrow accurately delimited beam of light is focussed onto any structure of the eye, while other parts remain in relative darkness. The contrast between the illuminated and contiguous unilluminated areas then permits microscopic study of fine details which had previously escaped observation.

The source of light is a small, closely wound Tungsten spiral enclosed in a nitrogen-filled bulb. A condenser consisting of two plano-convex lenses, placed with the convex surfaces toward one another, projects an image of the spiral into the diaphragm of the objective lens—plano-convex with the convex surface toward the light—of *7cm* focal length, which condenses the light to form an evenly illuminated surface less than *1mm* wide.

In the model of the Gullstrand slit lamp manufactured by Zeiss, the lamp is mounted independently on an extensible stand. The eye can be observed with the Czapski corneal microscope similarly mounted, and magnification varying between eight and one hundred and eight diameters may be used. The oscillation of the living eye precludes the use of higher magnification than this.

This armamentarium makes it possible to scrutinize the individual cells of the endothelial layer of the cornea, to see

single cells and agglutinated masses of cells in the aqueous humor, to see circulation of blood corpuscles in the finest capillaries, to see nerves in the cornea, to see structures in the vitreous, and to localize precisely the position of structures observed in the clear media of the eye.

Our studies may be roughly divided into two groups; one, the early development of the corneal lesion in healthy rabbits, which constitutes the major portion of the work, and second, the early changes observed in the eyes of animals previously inoculated with small doses of tubercle bacilli and, therefore, suffering from tuberculosis. These we hope to discuss in a second paper.

After the work was well in progress, white rabbits only were used. Slight vascular changes were found to be easier of detection in albinos and changes occurring at the limbus as well as in the iris were better seen. The rabbits weighed from 1500 to 2500*gms* and in each case the eyes were carefully examined with the slit lamp and microscope before inoculations were begun. Aside from tubercle bacilli, of which two virulent and one avirulent strains were used, comparative studies were likewise carried out on a small number of rabbits with, first, a virulent twenty-four-hour culture of staphylococcus aureus and, second, an emulsion of mercury sulphide in water. In so far as possible, these have been correlated with the main problem.

First Changes Observed.—Of the twenty-six rabbits studied, the first pathological change was observed four days after inoculation in twelve rabbits, three days after inoculation in seven rabbits, two days in three, and in one case each, five, eight, nine, and eleven days after injection. The time depends not so much on the virulence of the culture used as the method of inoculation and the number of bacteria introduced. In all cases where reaction occurred after the fourth day, the culture used was a virulent bovine strain. A superficial scratch and a weak suspension were used in the rabbits that showed the first change on the fifth, eighth, and ninth day respectively. In the case where the reaction occurred on the eleventh day, a deep inoculation of a virulent culture was made. No explanation for the delay can be offered except that of the varying susceptibility of different animals.

In the great majority of rabbits, the first change observed was a very faint injection of a leash of conjunctival vessels at the limbus. In the white rabbits, there could always be seen at the same time a pronounced accelleration of the circulation at the limbus. Not only were the vessels dilated but the blood flowed through them with much greater rapidity. In all the white rabbits where a virulent strain of bacilli was used, an injection of the small vessels of the iris preceded or accompanied the limbus hyperæmia. This early injection of the iris vessels was noted by Schieck in his studies in 1896 (Schieck—*Ziegler's Beitrage*, xx., p. 275). In the brown-eyed rabbits this change was overlooked, or possibly impossible of detection on account of the pigment of the iris. In no case of tuberculosis were cells seen in the aqueous preceding the vascular dilatation, though they were often seen simultaneously. When staphylococcus aureus was used, on the other hand, the cellular exudation was much more pronounced than the vascular reaction. In these cases, circulation could not be studied due to the intense œdema and clouding at the limbus. In the rabbits injected with staphylococcus aureus the first change was noticed in twenty hours, and probably was present even earlier. It consisted of an intense vascular injection together with œdema and severe purulent exudation.

Four eyes were injected with mercury sulphide, two of them, where larger amounts were used, showed injection of the vessels of the bulbar conjunctiva within twenty-four hours. In the other two, where smaller amounts of mercury sulphide had been used, the first change was noted on the fifth and sixth day respectively, and consisted of a very slight bulbar injection accompanied by cellular exudation. In none of the eyes where mercury sulphide had been injected was there a pronounced accelleration of the circulation at the limbus.

Cellular Exudation.—The study of cellular exudation proved to be of special interest. Cells are seen in the aqueous in the dark area between the two beams of light reflected by the cornea and iris respectively, and appear as bright glistening bodies (Tyndall effect). When the anterior chamber is very full of cells, the impression is that of a snow fall in a heavy wind. Cells on the lens surface appear as small whitish dots under the lower power, somewhat as white blood cells in the

counting chamber. Under the high power, the cells look white and perfectly round, with a homogeneous protoplasm. It is generally impossible to distinguish a nucleus. It is always easy to tell whether a deposit consists of one single cell or of an aggregation of cells stuck together. Pigmented cells are about two to three times as large as white cells.

On the iris, cells are seen with difficulty and only when they are very abundant can they be made out as small grayish-white bodies. Cellular deposits are readily seen on Descemet's membrane by focusing the microscope through the dark side of the prism which the slit lamp cuts out of the cornea. They appear as single or multiple white dots.

An exudation of small white cells, with a small admixture of larger pigmented cells in the brown-eyed rabbits, occurred anywhere from the third to the eighth day after inoculation. At times a few cells—not more than six—were seen on the lens as early as forty-eight hours after the injection. In 50% of the cases, cellular exudation was first seen on the fourth day. The cellular reaction was in all cases accompanied by hyperæmia of the bulbar conjunctiva. In some cases this hyperæmia preceded the exudation of the cells by twenty-four hours.

The extent, duration, and character of the cellular exudation differs depending on whether a virulent or relatively avirulent strain of tubercle bacilli is used. In the case of a virulent culture, the eye which has been entirely normal at the preceding examination, grossly shows a slight bulbar injection, accompanied or preceded by an intense injection of the small vessels of the iris. Microscopic examination shows the aqueous densely filled with small white cells. These cells are all single and float through the aqueous irregularly; in some cases there is a tendency to drop down into the chamber angle. A large number of cells settle out on the anterior surface of the lens. On the first day the lens is simply peppered with cells without any definite arrangement. On the following day or days there is often seen a distinct tendency to group formation, the denser grouping usually taking place toward the periphery of the lens. Later there is an agglutination of a number of cells which float free in the aqueous or adhere to the lens surface. The clumps may consist of only three to four cells, loosely adherent, or of ten to twelve, or more. In five cases a few clumps were

observed on the first day that cells were seen; in four cases, twenty-four hours later; in two cases forty-eight hours later; in two cases four days; and in one case six days after cells had first appeared. In all the cases that progressed to destruction of the eye, a grossly visible hypopion was eventually formed which consisted of piled up cells in the lower angle of the chamber. Whenever hypopion was seen it was associated with an aqueous full of cells.

Cellular deposits on Descemet's membrane were seen easily when a virulent culture was used. In five cases these deposits occurred on the same day that cells were first observed, in the other cases they were seen two to eight days later. In most cases these deposits were first noticed in the most dependent part of the cornea as distinguished from the deposits on the lens, whose distribution was entirely irregular. Special note should be made of one case where the deposits on Descemet's membrane were definitely grouped about the lesion at the site of inoculation. The opacity roughly vertically bisected the pupil. The lowest part of this opaque area was heavier than elsewhere and it was in opposition to this portion that the cellular deposits were grouped. The deposits were largest and most numerous just beneath the opacity and became progressively smaller and less numerous in the surrounding zone. They could not be seen with the microscope by illumination other than that of the slit lamp, nor were they visible with a + 16 or a + 7 lens of the ophthalmoscope.

When a relatively avirulent strain of bacilli is used, the primary result is practically the same, provided the emulsion of organisms is a sufficiently heavy one. A thin emulsion produces either no reaction whatsoever, or at most calls forth a very small number of cells. When a heavy emulsion is used, the aqueous and anterior surface of the lens are peppered with cells three or four days after inoculation. Within twenty-four to forty-eight hours all cells have disappeared from the aqueous and only a few are left on the lens surface. None are at any time found on Descemet's membrane. Cellular studies with an avirulent culture were carried out on six rabbits. In three of them the disappearance of the cells from the aqueous closed the pathological picture and the eye returned to normal. In three other rabbits short strands of new-formed vessels de-

veloped on the cornea. In two of these cases the vessels appeared twenty-four hours after the cells were last seen in the aqueous; in the other case the corneal vessels were first seen on the last day that the cells in the aqueous persisted. Clumping together of the cells was observed in all these cases on either the first or the second day after the cellular reaction began.

Cellular Reaction with Staphylococcus Aureus.—For the sake of comparison, two rabbits were inoculated intracorneally with an opaque emulsion of a twenty-four-hour culture of staphylococcus aureus. Within less than twenty-four hours there was a thick purulent exudation from the eyelids and the entire cornea was grossly dull. The aqueous was packed with white cells, as was also the lens surface. Many of the cells formed loose clumps. Some of them were adherent to Descemet's membrane. The following day the eye grossly looked much less angry. In one of the rabbits the cells had, to a large extent, disappeared, a moderate number of single cells remaining in the aqueous and on the lens surface. In the other rabbit the cells disappeared less rapidly. For two days the aqueous was packed with cells which settled out to form a hypopion. Three days later, however, this could no longer be seen, nor did any cells remain in the aqueous or on Descemet's membrane. Both rabbits showed a sprinkling of white cells on the lens surface which persisted until three weeks after inoculation.

To determine the part played by mechanical irritation only, four eyes of normal white rabbits were injected with mercury sulphide—a finely granular red powder. It is impossible to control the exact amount of material injected and it so happened that two of the eyes received a large injection, while in the other two a moderate amount only was introduced. In both eyes where the mercury sulphide was in heavy suspension, there was a bulbar injection within twenty-four hours and an occasional cell was seen on the lens. On the second day in one eye, on the third in the other, the anterior chamber was densely filled with cells and cells were seen on the lens, at first single, one to two days later in clumps, then single again just before their disappearance, one week after inoculation.

In the two rabbits where smaller amounts of mercury sul-

phide were introduced, the first reaction occurred on the fifth day in the one, and on the sixth day in the other. In both these cases the cellular exudation, together with a very faint bulbar injection, was the first sign of pathological change. The first rabbit at no time showed any injection of the conjunctiva or iris vessels, dulling of the cornea or other changes. Had the cells not been seen with the microscope, the eye would have passed as normal. Forty-eight hours after the primary exudation, clumped cells were seen in both rabbits, chiefly on the lens surface. Three days later all cells had disappeared from the lens and aqueous in the one rabbit, and only a faint sprinkling on the lens was seen in the other.

New Formed Vessels.—The formation of vessels is perhaps the most characteristic of the lesions seen in tuberculosis of the cornea. Its gross features have been accurately described by various investigators (2, 3, 5, 8). The earliest vessels are always observed at the limbus above, no matter where the corneal injection is made. These vessels usually attain a greater length than those coming in from below or from the sides, and eventually extend into the opacity at the site of injection. In the most advanced stages the entire cornea may be vascularized.

The new-formed vessels are generally first seen on the fifth to the seventh day. Occasionally the earliest strands can be detected on the fourth day, in one case they did not appear until the ninth day and in two until the eleventh day after the inoculation was made. In these latter cases, however, the incubation period has been unusually long. As a general thing it may be said that the earliest vascular shoots on the cornea are seen two to three days after the first signs of reaction have occurred. These shoots develop as short strands coming off from the superficial conjunctival vessels at the limbus and lie superficially on the cornea throughout their course, forming a sort of fringe at the limbus. At the time of their origin the cornea underlying them is clear. After 2–3 days of an irregular central-ward growth, strands of these vessels meet to form capillary loops, through which an exceedingly active circulation is maintained. As the vessels became larger they assumed a broom-like growth and increase in width as well as in length. The vessels just above the site of inoculation are of the greatest

length and eventually extend into the opacity, while the other vessels have formed short loops only.

When a virulent culture of tubercle bacilli is used the vessels develop more rapidly than when an avirulent strain has been injected. In the former case the vessels within three or four days become so large and the cornea becomes so dull that further slit lamp study is impracticable. Blood vessel formation is best studied when an avirulent culture is used and very short strands develop on a clear cornea. When the straight shoots first form, no circulation can be seen in them, but as soon as the strands are joined into loops, active circulation begins. From other loops further strands develop while the primary trunks increase in size. At most a small fringe of capillaries is visible to the naked eye and the vessels never reach into the inoculation site. When the avirulent strain is used, when healing begins, the circulation through the capillaries gradually becomes much slower and soon the vessels are grossly invisible, though microscopically they are still seen to carry a fine current of blood. The smallest capillaries permit the cells to pass by in single file only. In the most distal portions some of the loops become constricted off, at first show stagnant blood and later are obliterated entirely. In our experience the proximal loops have never completely disappeared, though they have been grossly invisible. When such an eye is re-injected, or otherwise irritated—by the introduction of O. T. into the sac, for example—the blood flow through these capillaries is increased and they can again be seen with the unaided eye as a fringe of newly formed vessels.

Although vessel formation is particularly striking in response to the tubercle bacillus, it can also occur after mechanical injury or injection with other organisms. Bŏrri (10) in 1895, showed that after mechanical erosion of the cornea, or injection of mercury bichloride or hydrochloric acid, newly formed vessels developed from the limbus and extended into the dulled area. In our series where mercury sulphide had been injected, very short loops of newly formed vessels developed in the two cases where a heavy emulsion was used and failed to develop in the two where smaller amounts of the mercury had entered the cornea. With the staphylococcus aureus active vascularization took place in all cases, extending from above well into

the area of inoculation. A fairly active circulation was maintained and persisted throughout the period of observation (10 weeks). Here it was interesting to observe that the veins were much more numerous than the arteries and at least three times as wide in diameter.

Changes in the Cornea.—The structure of the normal cornea as seen with the slit lamp and corneal microscope has been described by Koeppe (11) in his book entitled *Die Mikroskopie des Lebenden Auges*, and is pictured by Vogt (12) in his book, *Atlas of Slit-Lamp Microscopy*. When an emulsion of tubercle bacilli—or other foreign matter—is injected into the corneal stroma, a diffuse grayish-white opacity is formed, which fades within five minutes so as to be almost imperceptible. Microscopically it consists of an irregular gray granular area, lying at varying levels of the cornea and showing an epithelial defect at the point where the needle entered. At times instead of the grayish-white opacity described above, a heavy white lesion composed of short parallel lines results. Such an opacity consists of roughly square areas, each made up of 4–6 parallel lines. On a level just above or below such a square is another whose lines run at another angle which may be a right angle or as small as 15°. By superimposing these squares at different levels, the opacity is produced. This opacity does not fade within five minutes but appears practically unchanged in fifteen minutes. Within 18 hours it differs from the usual lesion only in its tendency to long finger-like projections extending from the main opacity into the surrounding tissue. The further course of the two lesions is otherwise identical. The large white opacity cannot be produced at will, but occurs only as a rare accident, in our series twice in 40 cases.

For the first 3 to 6 days the opacity at the site of inoculation remains unchanged. It has an irregular but well-defined outline and a distinctly granular appearance, dependent on the accidental grouping of the masses of organisms injected. The epithelial defect due to the needle puncture gradually disappears within twenty-four to forty-eight hours. On anywhere from the 4th to the 7th day (with occasional cases as early as the 3d, and one as late as the 12th day) the opacity begins to lose its definite edges and its granular appearance. The cornea immediately beneath and surrounding it becomes white and

opaque and the edges of the lesion blend with the surrounding tissue, while the opacity itself changes from a grayish granular to a fluffy yellowish white homogeneous mass of cotton-like appearance in which, within 2 to 3 days, a granular structure can no longer be made out. At this time there is usually a halo of less dense opacity about the central heavy yellowish-white area. Still later this mass breaks up into numerous small white lesions, lying peripherally and grouped as satellites about a larger central yellowish-white area. These are the miliary tubercles so characteristic of the advanced stages of corneal tuberculosis. At the time that the breaking up into small masses occurs, the vessels extend well into the opaque area and ulceration usually begins.

The course of events above described is that which takes place when the lesion goes on to ultimate destruction. In case healing occurs, the fluffy white mass soon regains its granular look and is definitely walled off from the cornea surrounding it. These changes were best studied in the rabbits injected with mercury sulphide, as the breaking up of the red masses can be more easily followed than that of the pale bacillary emulsions. In these rabbits no changes occurred in the dense red masses infiltrating the cornea until after the acute exudation of eucocytes had ceased and the surrounding cornea had been heavily infiltrated with cells. There then occurred a gradual breaking up of the dense red areas into smaller, more granular masses, especially at the periphery. For some distance about the injection site the cornea showed small foci of red granules. Where the mercury sulphide had extended along dense lines, these lines became broken and eventually assumed a dotted appearance. The dense central masses were, however, largely unaffected. Apparently none, or at best very little, of the mercury sulphide was removed, for the red areas appeared to be quantitatively the same when healing was complete as when first injected. The arrangement, however, was of a more broken and granular kind. Ten weeks after inoculation they persisted unchanged, though for the past 8 weeks the eye had otherwise been entirely normal.

A healed tuberculous or staphylococcus infection leaves a grayish granular opacity with well-defined boundaries, in a normal cornea, which persists indefinitely.

Occurring simultaneously with the changes in the opacity at the inoculation site, or perhaps shortly thereafter, the cornea loses its normal glistening appearance and becomes infiltrated with white cells. The part of the cornea first involved is that immediately surrounding the point of inoculation. Soon afterwards, or occasionally at the same time, the cornea becomes cloudy at the limbus above and shows a great increase in white dots—probably an infiltration with wandering cells. This dullness rapidly spreads so that within a few days the entire cornea is opaque.

DISCUSSION.

In a general way our results may be said to agree with those of other investigators, with the exception, however, that in every case we have been able to observe changes earlier than any hitherto reported. This is due partly to the slit lamp method of examination by means of which slight changes can early be seen, and partly to the fact that we used cultures of great virulence for rabbits. Nevertheless, we cannot get away from the fact that after the introduction of tubercle bacilli there is a latent period during which no reaction occurs, which is more definite and prolonged than when a simple foreign body or a pyogenic organism is used.

The stages during which we followed the tuberculous lesion were largely exudative. The question of the origin of cells into the aqueous has always been a matter of speculation. It is our belief that the extreme dilatation of the small iris vessels, observed prior to the cellular exudation, might permit the passage of wandering cells from these vessels into the anterior chamber. We have at several times seen a severely congested iris on the evening of one day, and the following morning have found the aqueous full of cells. We do not wish to infer, however, that the iris is the only possible source of cells in the anterior chamber. The cells in the primary exudation are probably largely leucocytes; in appearance they resemble the cells found after foreign body injection. Puncture of the aqueous, carried out in one case, showed the presence of polymorphonuclear leucocytes only. This cellular reaction, there-

fore, is not specific, but is simply due to foreign body stimulation.

After a time, however, this first active exudation of cells into the aqueous subsides and there are seen smaller numbers of cells chiefly on the lens surface and on Descemet's membrane which we believe to be lymphocytes.

The settling out of these precipitates on the lens has been often observed by ophthalmologists and has been attributed by them to the mechanical factor that man sleeps on his back. It was, likewise held, especially by Straub (13), that the clumps of cells on the lens and on Descemet's membrane were the result of a chance piling up of single cells. We have been able to show that the cells form loose clumps in the aqueous and float on to the lens or Descemet's membrane as a raft, as has been Fuchs' (14) assertion. That there is some specific substance in the lens which attracts cells toward it seems probable. Cells are never found on the iris when the aqueous is clear, but are often seen on the lens. In the rabbit, of course, there could be no purely mechanical sedimentation on to the lens, though sedimentation does undoubtedly occur on Descemet's membrane in the chamber angle. At times, however, precipitates are seen on Descemet's membrane in the small area about the primary lesion, and here too there may be some unknown substance which causes a migration to this area.

Lewis and Montgomery called attention to the significance of the exudation in tuberculosis and have remarked that if it were possible to prevent the exudation entirely, blood vessels would presumably never develop. We can confirm this in another way. The disappearance of the cellular exudation was in every instance the precursor of healing. On the other hand, while the exudate persists there is progressive destruction of the eye.

In connection with the new formation of blood vessels, it should be noted that increased circulation through existing vessels antedated the development of new capillaries and that a slowing of the blood stream was a sign that healing had begun. These phenomena must occur in response to some definite stimulus given out by the infecting organism or its product.

The fluffy white masses which we have observed in the cornea about the injected area resemble precisely the appear-

ance of the fibrinous exudate which is often seen in an otherwise transparent retina. We may, therefore, assume that the cotton-like appearance of the corneal lesion is likewise due to exudation about the point of injection. The clouding of the cornea itself takes place first about the site of inoculation and at the limbus above. The time of its appearance and the fact that it occurs primarily and most markedly in the areas where there was the most abundant blood supply, seem to indicate that the first corneal clouding results from infiltration of the stroma by wandering cells and that proliferation of the fixed tissue cells occurs only at a later date.

Our observations thus lead us to the conclusion that exudative inflammation is the first and most important tissue reaction in response to tuberculous infection.

SUMMARY.

1. The slit lamp and corneal microscope offer a valuable method for the experimental study of fundamental pathological processes as they take place in the living tissue of the eye.

2. In the study of experimental corneal tuberculosis produced by inoculation of emulsions of virulent bovine strains, the first change is seen most commonly three to four days after injection, and consists of congestion of the vessels of the iris and of the bulb, with an increase in the volume and speed of the blood flow.

3. After one injection of virulent tubercle bacilli, cellular exudations of white and pigmented cells occur within 3 to 8, usually 4, days. The cells are seen in the aqueous, on the lens surface, and on Descemet's membrane, at first single, later grouped, then clumped. Eventually the cells drop into the chamber angle and form grossly visible hypopion. When an avirulent culture has been used, cells are seen in the aqueous and on the lens three to four days after inoculation. They occur singly or in small clumps, disappear entirely within 24 to 48 hours, and are never found on Descemet's membrane.

Twenty-four hours after inoculation with staphylococcus aureus, the anterior chamber is densely packed with white cells, single and clumped, which settle out on the lens in the chamber angle, and on Descemet's membrane. Within one to

three days all cells disappear except for a small sprinkling on the lens which persists for 3 weeks.

After injection of large amounts of mercury sulphide, the anterior chamber and lens are packed with cells 2 to 3 days after inoculation. These persist for one week and occur at first singly, then in clumps, and finally singly again. When smaller amounts are used, the first cellular reaction takes place on the 5th to 6th day, and all cells disappear in 3 days.

4. Corneal vascularization occurs after any sufficiently severe irritation of the cornea. It is most characteristic in tuberculosis. New formed vessels arise on the 5th to the 7th day after inoculation. They begin as straight shoots which later form loops through which a very active circulation is maintained. Vessels are best studied after the introduction of avirulent tubercle bacilli. When healing occurs the new formed vessels become grossly invisible but persist as very fine capillaries microscopically. After irritation they become filled with blood and can again be seen grossly.

5. Inoculation of an emulsion of tubercle bacilli into the cornea causes the formation of a gray, granular opacity which fades within five minutes, or of a dense streaked white opacity which persists unchanged after 15 minutes. After 4 to 7 days this opacity becomes yellowish-white and fluffy, and eventually is broken up into miliary tubercles with ulceration. If healing occurs the gray granular appearance again replaces the white fluffy opacity, the surrounding cornea and the cornea at the limbus above is infiltrated with white cells and becomes dull and opaque.

BIBLIOGRAPHY.

1. Cohnheim and Salomonson. "Über Künstliche Tuberkulose," in Cohnheim, *Gesammelte Abhandlungen*, Berlin, 1885, 591.
2. Haensell, P. "Beitrage zur Lehre von der Tuberkulose der Iris, Cornea u. Conjunctiva." *v. Graefe's Arch. f. Oph.*, B. xxv., 4, 1879.
3. Panas et Vassaux. "Etude expérimentale sur la tuberculose de la cornée." *Archiv. d'ophtal.*, v., p. 194, 1885.
4. Kostenitsch et Wolkow. "Recherches sur le développement du tubercle expérimental." *Archives de médicine expérimentale*, T. iv. 1892.
5. Heydemann, Ludwig. "Beitrag sur Histogenese des Hornhauttuberkels. *Inaug. Diss. Greifswald*, 1894.

6. SCHIECK, Fr. "Uber die ersten Stadien der experimentellen Tuberkulose der Kaninchencornea." *Ziegler's Beiträge z. path. Anat. u. allg. Pathol.*, xx., Heft 2, 1896.
7. BACH. "Die Tuberkulose der Hornhaut." *Arch. f. Augenheilk.*, xxxii., 149, 1896.
8. KRUSIUS. "Zur experimentellen Tuberkulose des Auges." *Deutsch. Med. Wochnschr.* S. 1545, 1911.
KRUSIUS. "Demonstration experimenteller Tuberkulose des Auges. *Ber. u. d. 37 Vers. der ophthal. Gesellsch., s.* 345, 1911.
KRUSIUS. "Experimentelle Tuberkulosestudien." *Veröffentlichungen der R. Koch-Stiftung z. Bekampfung der Tuberkulose*, 5–7, 133, 1913.
9. LEWIS, PAUL A., and MONTGOMERY, CHAS. M. "Experimental Tuberculosis of the Cornea." *Jour. Exp. Med.*, vol. xx., No. 3, 1914.
10. BÖRRI, EMIL. "Experimentelle Keratitis parenchymatosa hervorgerufen durch Einwirkungen auf das Endothel der Hornhaut." *Inaug. Diss.*, Basel, 1895.
11. KOEPPE, L. *Mikroskopie des Lebenden Auges.* Julius Springer, Berlin, 1920.
12. VOGT, A. *Atlas of Slit-Lamp Microscopy.* Julius Springer, Berlin, 1921.
13. STRAUB. *Arch. f. Ophthalmol.* Vol. lxxxvi.
14. FUCHS, ERNST. *Arch. f. Ophthalmol.* Vol. lxxxiv.

OCULAR SPOROTRICHOSIS.[1]

By Dr. S. R. GIFFORD, Omaha, Nebr.

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(*With four illustrations on Text-Plate XXI.*)

THE interest of this case arises first from the unusual location of the process in the lacrymal sac, and second from its being the fifth case in the United States in which a diagnosis of ocular sporotrichosis was confirmed by culture.

Case.—Adolph, aged 8, a farmer's son of Belvidere, So. Dakota, was first seen by Dr. H. Gifford, March 6, 1922. Three months before, a swelling developed over the left lacrymal sac. It was incised by his family doctor, but the opening continued to discharge. When first seen, he showed a fistula just below the lacrymal sac from which a good deal of pus could be squeezed out. The edges of the fistula were thickened, red and everted. (See Fig. 1.) Exploration under general anæsthetic showed that the opening was ⅖ inch in diameter and extended back 1½ inches into the left anterior ethmoid cells, which were full of pus. The lacrymal sac was continuous with this opening and over the whole inner wall the bone was left bare. The ethmoid cells were exenterated by Dr. John B. Potts, intranasally, after removal of the left middle turbinate and the passage was enlarged so that a tube could be placed through it into the nose, making a modified West operation. The discharge was much less on his return home four days later. On account of the laboratory findings, he was put on potassium iodide at home. Two months later his doctor wrote that there was less swelling but still some discharge. He had

[1] Read before the Sioux Valley Eye and Ear Academy, July, 1922.

ILLUSTRATING DR. GIFFORD'S ARTICLE ON "OCULAR SPOROTRICHOSIS."

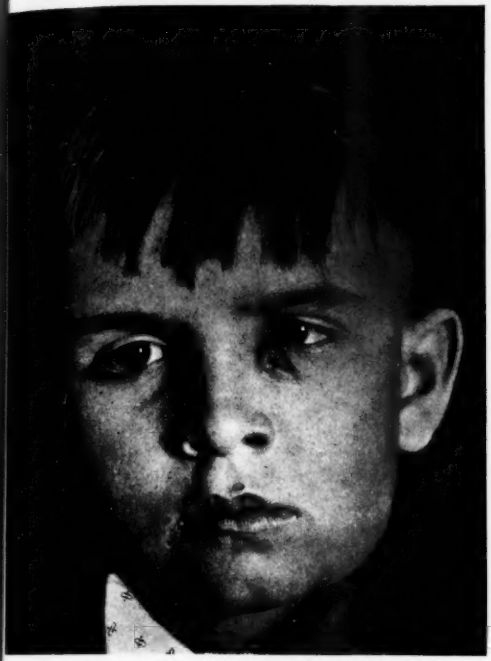

FIG. 1.—Case I at time of first visit.

FIG. 3.—Hanging drop photograph of culture in Case I.

FIG. 2.—Seven day culture from Case I.

FIG. 4.—Case III.

been obliged to stop the iodide on account of gastro-intestinal disturbances.

He returned three months later. The opening was still present in the skin but only a few drops of pus could be squeezed out of it. The fistula was cauterized with trichloracetic acid and tincture of iodine was applied to the deepest parts several times. In spite of this and general treatment with potassium iodide, the sac has continued to fill up with pus and a fairly deep opening in the bone is still present, though the opening into the nose has closed up. After the connection between the conjunctival sac and fistula had been destroyed by cauterization so that the tears could no longer get into the bottom of the fistulous opening, it began to heal better and at present seems to be healing from the bottom, though slowly.

Bacteriologic Findings.—Smears of the pus at the first examination showed no organisms. Culture on plain agar left at room temperature showed after five days six discrete white colonies of slightly leathery consistence, with fine lines radiating from them (Fig. 2). Smears of these colonies showed the separate threads with lateral and terminal spores characteristic of Sporothrix Schenkii (Fig. 3). A white rat inoculated with the pure culture died in seven days and the organism was recovered from the peritoneal cavity. A rabbit inoculated in the anterior chamber developed nodules in the iris and cornea with a severe reaction, which subsided after three or four weeks. Dr. Hektoen of the John McCormick Memorial Institute kindly examined my material and pronounced the organism Sporothrix Schenkii. At the patient's second visit, only ordinary pyogenic organisms could be found in the pus by culture, evidently secondary invaders.

Since H. Gifford's paper, in 1910, besides the present case in which the culture was positive, we have seen at least two other cases which were probably of sporothrichotic origin, although cultures were negative. The first was a girl of thirteen years with an ulcer including the outer third of the right upper eyelid with some enlargement of the glands on that side. Culture of the material curetted from the region was negative, but the ulcer healed up rapidly under potassium iodide. The second case is very similar to H. Gifford's first case and concerns a girl of 21 with a nodule of the conjunctiva at the outer limbus, which had existed for about six months and had been removed once by another doctor but had recurred. When seen, the appearance was that seen in Fig. 4. Cultures at room tem-

perature and in the incubator were negative. The lesion cleared up under potassium iodide.

Literature.—After Schenk's first report in 1898, and its confirmation by Hektoen and Perkins in 1900, a number of cases of sporotrichosis were reported, chiefly in this country and France. Among these were a number involving the eyes and adnexa, but these were nearly all from France. The first American case of ocular sporotrichosis was that of H. Gifford (1) in 1910. The lesion involved the ocular conjunctiva, a location which had not previously been reported and sporothrix was grown in cultures. He describes five other cases which were almost certainly of like origin, four of these involving the lids, the other the conjunctiva and lacrymal sac. In two of the lid cases also the lesion was situated over the tear sac, and may have originated from it. Wilder and McCullough (2) in 1913 reported conjunctival sporotrichosis occurring in one of the authors who received part of a pure culture of sporothrix, with which he was working, in his conjunctival sac. It is interesting as showing that infection can occur on an apparently intact conjunctiva. The local and general reaction was severe, but responded to potassium iodide. Careful observations were made, including agglutination tests with the patient's serum against five strains of sporothrix, all of which were equally positive. Increase of opsonic index for all strains was equally marked. This is of bacteriologic value, as added evidence of the identity of Sporothrix Schenkii and Sporothrix Beurmanni, since one of the strains used was the latter. Dwyer and Larkin (3) in discussing Wilder's paper, described a case with generalized sporotrichotic abscesses, several of which were on the lids. His serum was markedly positive. This would be the third American report, though I believe no detailed description of the case has appeared. Bedell (4) in 1914, reported the fourth proven American case, a chronic conjunctival involvement with a rather large granulation mass on the inner side of one lid. The canaliculi and lacrymal sac contained a number of brown masses resembling streptothrix concretions but yielding sporothrix on culture.

Since most of the cases before 1913 are well summarized by Wilder and McCullough, and Bedell's paper gives a complete bibliography up to 1914, it will be necessary only briefly to

mention a few cases not described by the former writers and those reported since 1914. Toulant (5) summarizes the subject very completely, transcribing practically in full all reports previous to 1913. Of the 23 cases he collected, 22 were reported in France, the other one being H. Gifford's. Of these cases the lesions involved the skin of the lids in six, the conjunctiva in six, the lacrimal sac in one, the brow in one, the interior of the globe in six and the orbit and lids together in three. Four cases were fatal, some from the cachexia of a general infection, one from an intercurrent disease.

In thirteen of the twenty-three cases, the ocular infection was primary, and this was especially true of the palpebral and conjunctival lesions. All six intraocular involvements were secondary to generalized sporotrichosis, the infection being carried by the blood stream, as has been shown in animals by Bourdier (6) and Toulant. To his summary may be added nine later cases, all but 3 of which were confirmed by bacteriologic evidence, making a total of 32 cases. Of the nine later cases, 6 involved chiefly conjunctiva or cornea, one the lids, one the orbit, and one the lacrimal sac. Of the cases not described in Wilder's report, that of Legry, Sourdel and Velter (7) is worthy of note, a violent iridocyclitis with sporotrichotic gummata of the iris, and later perforation of the sclera, occurring as an incident in generalized sporotrichosis. Chaillous (8) saw a case of panophthalmitis ending in phthisis bulbi, but here the infection was probably from an ulcer of the lid border causing secondary ulcers on the limbus from which the infection evidently involved the globe. Dor's case (9) is interesting, since the child developed his infection first on the lesion of a smallpox vaccination. From here he evidently inoculated his cornea by a finger and an ulcer ensued which ended in a staphyloma. The diagnosis was not made until a characteristic gumma on the sternum developed, and the potassium iodide given after this resulted in recovery from what otherwise would have been, apparently, a fatal infection.

Since Bedell's paper, only 4 reports of ocular sporotrichosis have appeared, one each from France, Spain, Italy and Mexico. Positive cultures were obtained in two of these cases. Thibierge and Chaillous (10) in 1914 reported a case of intraocular infection, the only case, so far as I know, in which the retina

was involved. The patient had had numerous subcutaneous nodules, including one on the eyelid. Later an iritis with synechiæ developed, apparently by an independent metastatic process, vitreous opacities formed and a large raised yellow spot appeared in the retina. Vision was reduced to counting fingers.

Leoz (11) in 1917 describes a case seen by Balbuena and himself, which, when Balbuena reported it at a society meeting in 1915, was the first Spanish case. The patient presented corneal scars and 4–5 crateriform ulcers of both corneæ. The submaxillary glands were enlarged, but there was only slight congestion about the corneæ. The ulcers healed under potassium iodide in doses up to six grams a day. When this was stopped on account of iodism, a conjunctival gumma developed and then similar nodules over the insertions of all the ocular muscles. Fluid from one of these gave sporothrix on culture, and under potassium iodide by mouth and injection of 5% potassium iodide solution into the nodules, all gradually disappeared. He saw another case, with numerous nodules on the cornea and sclera which yielded to potassium iodide and were considered sporotrichotic in origin, though there was no material for cultures. In another case, a child of eleven, with numerous gummata all over the body, both eyes were involved. The right lower lid was destroyed, the eye was atrophic, and a purulent infection was present in the orbit. The left cornea was entirely destroyed and two conjunctival gummata were present. The child was totally blind and practically moribund. This was before the author knew of sporotrichosis and under mercury and salvarsan, the process went on to death in two months. No cultures were made, but after seeing cases of sporotrichosis, it was considered to have been certainly of that nature. Oreste (12) in 1919 reported an apparently typical case of conjunctival sporotrichosis in a medical officer. It yielded to potassium iodide but was not cultured.

Gonzalez (13) in 1921 reported a remarkable case of orbital involvement. The patient, a woman of 21, showed gradually increasing exophthalmos, paralysis of most of the ocular muscles, and a severe corneal ulcer from exposure. Tuberculin tests were negative, and mercury had no effect. On incision into the orbital mass, a little pus escaped, but symptoms remained the same. A nodule behind the ear was peresent. After

being lost sight of for four years, the patient returned in a much worse general condition, with a blind eye protruding beyond the lids, complete ankylosis of the jaw, and ulcers of the sternum and parietal bone. Smears of pus from the latter lesion showed spores and a few threads, and under potassium iodide immediate improvement began. All the lesions healed, and the exophthalmos disappeared, though the globe remained immovable, even to digital pressure, being evidently held in a mass of adhesions. Though no cultures were made, the author made the diagnosis of sporotrichosis clinically and from the smears.

In relation to the present case, a brief account of one of Morax's cases (14) would seem in place as it is apparently the only other proven case with a definite dacryocystitis. (Bedell's lacrimal concretions produced an entirely different picture.) Morax's patient was a man of forty who had been suffering from lacrimation of the left eye for about two years. His glands were swollen and he had two nodules on the cheek. When first seen, a severe dacryocystitis had existed for five weeks and a pre-lacrimal abscess had formed. After opening and curetting the caseous mass, the duct could be probed easily and function was restored. Culture was positive. In another of his cases (15) with a nodule over the sac, an origin from the sac seemed likely, but the sac and ducts had been left intact.

With regard to the bacteriology of the disease, it was formerly believed that two distinct organisms, Sporothrix Schenkii and Sporothrix Beurmanni, were responsible for most of the reported cases, the first causing all of the American cases, and the latter almost all of the French ones. Davis (16), however, has apparently proven that the two strains are identical and hence should both be called Sporothrix Schenkii, after the prior observer. He found pigment formation to vary greatly in both strains, and that both could form chlamcydospores. As concerns agglutination, complement fixation and skin reactions, experiments with both strains gave identical results, as Wilder and McCullough had shown in part. He believes there are two varieties, Sp. Dori and Sp. Councilmanni, which are distinct and which have caused a very few human infections, but that practically all cases are due to one organism, Sp. Schenkii.

In America, as is well known, sporotrichosis is peculiarly a disease of the Mississippi basin. Of 58 American cases collected by Hamburger (17) up to 1912, fifty were from the Mississippi basin, 22 were from North Dakota, where it occurs also in horses, and 13 were from Kansas. This is partly due, no doubt, to the fact that where one case has been reported, clinicians are on the lookout for others. Thus Sutton (18) in eight months saw five cases. Morax reported four and H. Gifford six cases of ocular sporotrichosis. The only other cases of any form of sporotrichosis reported from Nebraska are by Wohl (19), MacLean (20) (the latter's patient having come from South Dakota) and Watson (22). Watson's five cases, all involving the upper extremity, all came from an area in Nebraska within twenty miles of each other.

This means that many cases are probably being missed, as wherever special attention has been paid to it, cases have been observed. They have now been seen all over Europe, in South America, Mexico, probably in India and even in Madagascar. (Davis.) It is remarkable that there are not more cases, as its cause is fairly common in nature, pathogenic organisms having been obtained from several common plants. (Toulant 5.)

This summary of cases and the reports of Wilder, Toulant, and others give some suggestion of the protean nature of the disease. It may affect all parts of the eye, and under quite different appearances. Since the lesions are persistent and recurrent, causing serious destruction of tissue, and even death in a few cases, if left untreated, and since we have in potassium iodide such an effective agent against them, it is especially important that the various forms of sporotrichosis be kept in mind. The most common forms are ulcers of the lids and conjunctival sporotrichosis. But besides the typical ulcers developing from papules and involving chiefly the epithelium, the larger subcutaneous gummata must be remembered, which may break down to form deeper ulcers, or extend into the orbit, sometimes involving its bony walls. The lesion may develop in the bony walls themselves, as it does in the long bones and skull. In all these cases, syphilis and tuberculosis must be excluded and often the diagnosis can only be made by positive culture. This is especially true in differentiating the con-

junctival form from Parinaud's conjunctivitis, which it may exactly resemble. One culture should be left at room temperature for five to six days but by Gougerot's method of examining the walls of the tube over which the pus was streaked, a diagnosis may often be made earlier. The intraocular forms are usually diagnosed by looking for the presence of lesions elsewhere which will give clinical or cultural evidence.

Treatment, as is well known, is by free use of the iodides internally, from sixty to 180 grains daily, combined, according to some authors, with collyria of potassium iodide and injections into the lesions. Davis (21) has shown that potassium iodide has no bactericidal effect on the organisms, but in some way stimulates the tissues to wall them off and destroy them. This occurs slowly, and hence it is important to continue iodide treatment for a considerable time after apparent healing, otherwise the lesions will recur.

BIBLIOGRAPHY.

1. Gifford, H. *Oph. Record*, 1910, xix., p. 580.
2. Wilder and McCullough. *J. A. M. A.*, 1914, lxii., p. 1156.
3. Dwyer and Larkin. "N. Y. Academy Oph. Soc., Dec. 15, 1915." Abst. in Arch. of Oph., 1914, xlv., p. 162.
4. Bedell. *Proc. Am. Oph. Soc.*, 1914, xiii., 720.
5. Toulant. "La Sporotrichose Oculaire." *Thèse de Paris*, 1913. (Surgeon General's Library.)
6. Bourdier. *Arch. d'Oph.*, 1912, xxix., p. 601.
7. Legry, Sourdel and Velter. *Ann. d' Oc.*, 1911, cxlvi., p. 142.
8. Chaillous. *Ann. d'Oc.*, 1912, cxlviii., p. 321.
9. Dor. *La Clin. Oph.*, 1911, xvii., p. 121.
10. Thibierge and Chaillous. *La Clinique Oph.*, 1914, xx., p. 126.
11. Leoz. *Arch. de Oft. Hispano-Americano*, 1917, xvii., p. 193.
12. Oreste. *Gaz. Med. Napoletana*, 1919, ii., p. 326.
13. Gonzalez. *Ann. de la Soc. Mexicana de Oft. y Oto-Rino-Lar.*, Febr., 1921.
14. Morax. *Ann. d'Oc.*, 1911, cxlv., p. 49.
15. Morax. *Ann. d' Oc.*, 1913, cxlix., p. 183.
16. Davis, D. J. *J. Inf. Dis.*, 1914, xv., p. 483; Univ. of Wisconsin Studies (Russell Anniversary Vol.), p. 105.
17. Hamburger. *J. A. M. A.*, 1912, lix., p. 1590.
18. Sutton. *J. A. M. A.*, 1914, lxiii., p. 1155.
19. Wohl. *Nebr. State Med. Journal*, 1920, v., p. 355.
20. MacLean. *J. A. M. A.*, 1917, lxix., p. 1774.
21. Davis, D. J. *J. Inf. Dis.*, 1919, xxv., p. 124.
22. Watson. *Nebr. State Med. Jour.*, 1922, vii., p. 282.

A NEW METHOD OF REMOVING THE LENS IN ITS CAPSULE.

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(With four figures in the text.)

THE removal of the lens in its capsule is a very old procedure; all ophthalmic surgeons admit that if it couldl be performed without the loss of vitreous it would be an idea operation, as it reduces the after complications enormously. Macnamara performed it in preference to any other operation, and as I was his house surgeon for two years I can testify to the excellence of most of his results. He performed the operation in a very simple manner. He operated by opening the cornea with a very broad straight keratome, which was perfectly square, having one corner directed in front, which served as the entrance point. This he inserted obliquely through the cornea at the limbus, and then lowering the handle he pushed the keratome above the iris right to the opposite side of the eye as far as the blade would go without actually touching the ciliary body. He then withdrew the knife and holding the eye with the fixation forceps to steady it, inserted a flat spoon which had a thickened rim in front, right into the wound. Then rotating the handle so as to bring the spoon under the iris nearest to him, he transfixed the ligament, and reversing the direction of the handle, he slid the spoon along the back surface of the lens until he caught its opposite edge, and drew the latter out of the wound in its capsule. This operation caused the shaft of the spoon to press the iris towards the periphery, which resulted in the pupil becoming pearshaped, a condition which usually remained permanently after the opera-

tion. This, however, was no practical objection, as it did not materially affect vision. The chief objection lay in the fact that the act of pushing the spoon behind the lens and dragging the lens out caused a small amount of vitreous to escape in a good many cases, although rarely an amount sufficient to become a danger to the sight. Notwithstanding this, it was an excellent operation, although it was capable of considerable improvement. I, therefore, at a later date made a number of experiments on animals, and as a result came to the conclusion that if I could extract the lens from the front instead of from behind I should greatly diminish the chance of losing vitreous. My experiments confirmed my theory, with the result that now I never resort to any other method of extraction in favorable cases. Of course there are cases in which the operation is not suitable, but these the surgeon will readily discover for himself, and they need no description. The operation is much simpler than Smith's, for the reason that the lens is never rotated so as to cause a "tumbler" as Smith calls it. Moreover the operation requires a minimum of skilled assistance, since the operator merely requires his assistant to hold the upper lid away from the eye during extraction, and at the same time with his other hand to steady the eye with a fixation forceps. I may however add that in many cases the ligament is so fragile that it is preferable to squeeze the lens in its capsule right out through the wound by simple pressure with a squint hook on the cornea, at the gap between the edge of the lens and the ciliary ridge, in other words, just above the circumlental space.

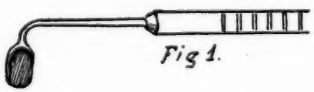
Should, however, the lens refuse to budge *on slight pressure* I at once revert to the spoon method. I have performed either this operation, or the simpler one just described for very many years, and I never had any wish to return to the more classical methods.

Preliminary procedures.—Before operating I first examine the nasal cavities and sinuses with a mirror, and if they prove satisfactory I thoroughly flush out the eyelids with warm neutral saline. I then place a sterilized pad of lint and a bandage on the eye, and leave it for twenty-four hours undisturbed. If at the end of that time the pad is quite clean, without a trace of mucus or pus, I know it is safe to begin the operation. This is preferable to any bacteriological examination of the lids,

as there are always some pathogenic germs present, and they are apt to herald danger which does not exist. The day before operating I also drop some atropin into the eye and if the pupil does not dilate I suspect adhesions, and take measures accordingly. It is always a good plan to give the patient a day's rest in bed before operating, as it tends to calm him, and at the same time one can get his bowels attended to.

I will first describe the simple method.

I make the usual incision 1½*mm* below the horizontal diameter of the cornea, and 1*mm* outside the limbus, carrying the narrow Graefe knife (which should never be less than 32*mm* long in the blade) just inside the cornea all the way through. This makes the largest section possible, *i.e.* one very nearly equal to half the circumference of the cornea. I then perform an iridectomy in the usual way. If there is much bleeding on cutting the iris, I prefer to put off any further operation for a week or ten days, until all the blood has disappeared. I have always regretted not doing this, and never regretted waiting. If I suspect adhesions, I pass a small silver spatula between the lens and the iris, so as to free it all the way round. I then remove the speculum, and get my assistant to hold up the upper lid with a squint hook after Smith's method. With his other hand the assistant grasps the conjunctiva at the lower side of the eye, without putting the slightest pressure or traction on the globe. I then take a shallow flat silver spoon shaped like a shovel (Fig 1) which I insert into the wound, and pressing it slightly downwards and forwards (*i.e.* towards myself) push it through the ligament into the vitreous a very little way, so that it is just past the free edge of the lens in its capsule. The moment I gently tilt the edge of the lens up, a little vitreous will usually show itself if the eye is healthy. It is a good sign, as it shows that everything is going well with the eye. If it



The shovel spoon. Actual size.

tends to get out of control and protrude too much, I get my assistant to gently pull the conjunctiva upwards and

slightly away from the eye. This at once causes the vitreous to recede. Then taking a second squint hook in my right hand, I press the cornea with it, the concavity of the hook facing me, and press it firmly down into the circumlental space immediately in front of the ciliary ridge. As I increase the pressure I can feel the edge of the lens beneath the now doubled up cornea. This pressure causes the wound to gape enormously. As I continue the pressure at the same time altering the direction of the hook towards the gaping wound, the lens intact in its capsule comes rapidly forwards on the shovel, completely filling the mouth of the wound, and thus entirely preventing the vitreous from escaping. Should, however, the least sign of its doing so appear, the slightest traction of my assistant's fixation forceps away from the globe causes it to recede immediately. The lens in its capsule slides along the bowl of the trowel, and as it emerges the wound closes over it, until the two edges meet together. Nothing now remains to be done except to adjust the edges of the iris so that they do not catch in the wound, and then carefully bandage up the eyes. As soon as the bandage is adjusted, I generally put a wire cup-shaped screen over the eye, so that the edges rest on the rim of the socket. This I remove at the end of the fifth day, *i.e.* as soon as the wound is sealed up.

The alternative operation.—In some cases it will be found that the ligament will not yield easily to slight pressure, so as to allow of the lens being pushed out in its capsule by the squint hook. In these cases I employ a specially designed spoon which I got Luer of Paris to make for me (see Fig. 2).

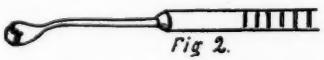


Fig 2.

The extraction spoon. Actual size.

It consists of a nearly flat silver spoon having a slight lip at its end. This lip is quite sharp, but folded forward so as to be parallel with the floor of the spoon. It will thus be seen that it cannot injure the iris or capsule when it is gently pushed between the two. The shaft is bent at an angle so as to enable one to slide it more easily along the capsule beneath the iris

as far as the edge of the lens, when the lip of the spoon can be felt to slip over its edge, and the slightest traction of the handle will cause the point to dig into it. This effectually prevents the lens slipping away from the spoon, when the end of the lens is depressed so as to bring the other end into the wound along the floor of the shovel.

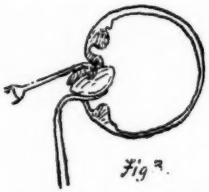


Fig 3.

Diagram of squeezing out method. (Fig. 3)

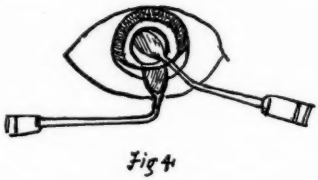


Fig 4.

Diagram of forcible extraction method. (Fig. 4)

A little traction and coaxing will cause the lens in its bag to slide beautifully along the sloping shovel out of the wound. During all these years I have rarely lost any serious amount of vitreous, and the last ten years I have never lost enough to have the slightest effect on vision. My experience goes to show that so long as the vitreous completely covers the whole of the retina up to and including the ora serrata, no harm to vision will result, but once the loss causes the ora to be uncovered the result will be unfavorable in direct proportion to the amount of vitreous lost, and this will become more evident as time goes on.

In my cases of recent years I have never lost more than would equal a pea in amount.

In my operations there are only six things which I have to fear. They are, internal hemorrhage with consequent glaucoma; retinal detachment; iritis; suppuration; rupture of the capsule with consequent breaking up of the lens and with the danger of some pieces being left behind; and lastly, failure of the wound to heal.

The three first are unavoidable. Suppuration in my cases has always been due, either to unsuspected nasal discharge, or—and that is far more common—to the patient working his septic fingers under the bandages to relieve the itching which

invariably accompanies a wound. Rupture of the capsule may nearly always be avoided by pushing the shovel well under the edge of the lens before pressure is applied to dislocate it from its attachments. By this means, the moment pressure is applied to the opposite side of the lens, there is nothing to oppose its coming forwards, and consequently there is no pressure put on the capsule to rupture it. Lastly non-closure of the wound usually happens in the case of feeble or diabetic patients, but one can generally obtain healing by cauterizing the edges of the wound, together with liberal doses of opium administered by the mouth.

In conclusion, if the reader will try these two methods I feel convinced he will be pleased with the splendid results he is sure to get. Both the shovel and the special spoon can be obtained from Luer, 104 Boulevard, St. Germain, Paris. The shovel is shown in Fig. 337 of Luer's catalogue for 1909, the only difference being that I bent the shaft to a right angle to keep the handle out of the way when operating. The traction spoon was made specially from my design by Luer, but the drawing (Fig. 2) is sufficiently accurate to enable him to make a copy.

BLEPHAROCHALASIS.

By Drs. FREDERICK H. VERHOEFF and JONAS S. FRIEDENWALD.

(From the Laboratory of Pathology of the Massachusetts Charitable Eye and Ear Infirmary and the Department of Pathology of Harvard University.)

(With three illustrations on Text-Plate XXII.)

BLEPHAROCHALASIS, though a rare condition, has, nevertheless, been subject to fairly frequent pathological studies. This is readily explained by the fact that the treatment of these cases is so commonly surgical. We wish to report this case because it shows certain lesions not previously described, and particularly because these lesions offer a possible clue as to the pathogenesis of the condition.[1]

CLINICAL HISTORY.[2]

Miss Mary G., aged 20, was first seen on September 25, 1921. She complained of a peculiar enlargement of both upper lids, which had come on suddenly about 3 years before. She stated that she had wept a great deal one day and that her lids had become greatly swollen in the evening. On the following day she was surprised to find that the swelling had not disappeared. In the course of three years this swelling had gradually increased. No other changes were noted.

The skin of the upper lids was very finely wrinkled, loose and redundant and gave the appearance seen in the aged whose fat tissue has disappeared, but in contrast to this,

[1] For a review of the literature see Loeser (9).

[2] We are indebted to Dr. Harry Friedenwald of Baltimore for the history and for the specimens examined.

ILLUSTRATING DR. FREDERICK H. VERHOEFF AND DR. JONAS S. FRIEDENWALD'S ARTICLE ON "BLEPHAROCHALASIS."

FIG. 1.—Blepharochalasis.

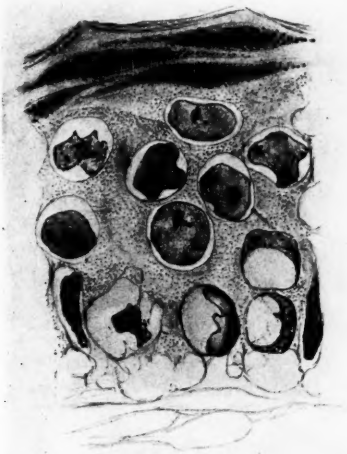


FIG. 3.—Epithelium under high power showing marked vacuolization and the basal cells. Magni. x 970. Hæmatoxylin and eosin.

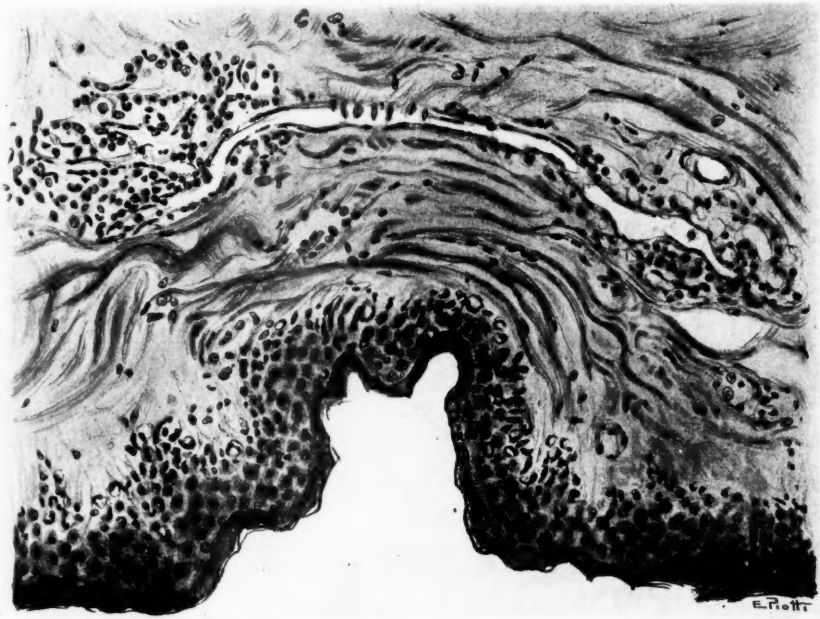


FIG. 2.—Showing changes in inner layers of epithelium, the loose arrangement of the fiber bundles of the corium, and the proliferation of the endothelium at two areas along the course of a venule. The formation of capillaries in these areas can be recognized. Magni. x 375. Hæmatoxylin and eosin.

her lids were slightly puffy (Fig. 1). The skin was soft and even to the feel, and contained no nodules. The eyes were otherwise healthy, the eyegrounds normal.

V. od. — 1. S. — 1.25 c. ax 105 = $\frac{20}{15}$
V. os. — .75 — 50 ax 90 = $\frac{20}{15}$

Clinical diagnosis, blepharochalasis.

On October 14, 1921, under local anæsthesia an elliptical strip of skin and subcutis extending the whole breadth of lid, and as wide as seemed possible without danger of shortening the lids, was excised from each eye. There was considerable postoperative swelling and the lids remained puffy. Three months after the operation there was still much swelling, and a great number of fine whitish spots and numerous small dilated superficial venules were seen in the skin of both upper lids. The patient was last seen June 26, 1922. Her condition was unchanged and her lids were still markedly puffy as is seen in the photograph taken at this time.

General medical examination revealed no evidence of cardiac or renal trouble, nor of myxœdema.

PATHOLOGICAL EXAMINATION.

(4489) The material examined consisted of two long narrow strips of skin and subcutaneous tissue, one from each upper lid. After formalin fixation one piece was embedded in celloidin, sections were stained in hæmatoxylin and eosin and also in Verhoeff's elastic tissue stain. The other piece was embedded in paraffin and sectioned at the laboratory of the Army Medical Museum to which we are indebted for several sections. The material from both lids showed identical lesions.

The epithelium is slightly thinned being about four cells deep with a covering keratinized layer which varies from 5–15*mm* in thickness. Quite striking is the uniformity in thickness of the epithelium which remains almost constant throughout all the tissue examined, forming a marked contrast to the normal where the epithelium often varies by 1–2 times its thickness within the same low power field. There is an almost complete absence of the interpapillary epithelial downgrowths. A large number of the basal cells and a much lesser number of the prickle cells exhibit marked swelling and vacuolization, a vacuole at times attaining such size as to press the nucleus into a narrow sickle shaped band along one cell margin.

The corium, like the epithelium, is of less than normal

thickness, and is of far less dense structure than normal. Instead of the almost uniform fibrillated tissue which one usually sees, the individual fibers of which are not easy to distinguish, the stroma here consists of fiber bundles almost every one of which is clearly separated from the others.

Special stains for elastic fibers do not reveal the dense whorls of these fibers often found in normal tissue, but on the other hand, the number of elastic fibers normally varies within wide limits and places can readily be found, in the normal, showing quite as little elastic tissue as any parts of the tissue we examined.

The subcutis partakes of the same general changes as the corium. Numerous large extravasations of blood are found in the corium and subcutis, but these are no doubt due to the operation of removing the tissue. The hair follicles, sebaceous and sweat glands are normal.

The outstanding pathological feature of the tissue is to be found in relation to the blood vessels, especially the capillaries and smaller venules. There is, first of all, an increase in the number of vessels, most of which are dilated and filled with corpuscles. Some of the endothelial cells of the smaller venules are swollen and bulging into the lumen, their protoplasm stains feebly and at times contains vacuoles, and their swollen pale nuclei appear oval even on cross section, instead of flattened, fusiform, or crescentic. About many of the smaller venules there is a sheath of cells far more numerous than normally found, and many of these cells partake of the same pale staining swollen and even vacuolated appearance as the endothelial cells just described. Their finely reticulated protoplasm makes a syncytium, and this syncytium sometimes forms bridges with the protoplasm of the endothelial cells lining the lumens, thus proving the origin of the cellular proliferation.

As one proceeds along a venule toward its capillary sources this perivascular cell accumulation irregularly increases and often widens out into a thick tuft of cells about the smallest venules or even about a capillary. In these tufts one sees quite clearly what has been only suggested elsewhere along the vein, namely a coalescence of the vacuoles of these proliferated endothelial cells to form new capillary channels so that the tuft often suggests the appearance of a kidney glomerulus. All gradations of cell forms are seen from the swollen pale cells with round or oval nuclei and finely reticulated protoplasm which form a syncytium, to flattened and normal looking capillary endothelium. In spite of careful search no mitotic figures are seen. Scattered among these cells are numerous chromatophores whose pigment is evidently not hæmatogenous since it is decolorized by

potassium permanganate followed by oxalic acid, and fails to give an iron reaction with potassium ferro- or ferri-cyanide.

These masses of proliferated cells vary greatly in size and complexity. They are very numerous, and accompany almost every capillary and venule in the corium, so that no high power field is free from them, and they thus make up a considerable part of the bulk of the tissue. They are found not only scattered throughout the connective tissue, but also very frequently about a hair follicle or gland, in which case they no doubt arise from the capillary net which normally surrounds these structures.

DISCUSSION.

The first pathological study of this condition was made by Fehr (6) who called attention to the marked atrophy of all parts of the skin, the loss of the interpapillary epithelial downgrowths and the dilatation of the vessels. He noted the pigment bearing cells and suggested that the pigment might be hæmatogenous. The elastic fibers, he said, were normal in number, but of less than usual thickness.

Subsequent observers have in the main confirmed Fehr's findings though the question of the number and size of the elastic fibers has been debated pro and con, and though Weidler (18) claimed to find no changes at all except an œdema of the corium and a slight round cell invasion of the tissue.

Much attention has been given to the blood vessels which most observers agree are dilated and increased in number. Rohmer (13) reporting on four cases stated that the dilatation of the blood and lymph vessels was the outstanding feature of the condition and proposed the name "Angiomégalie symétrique des paupières supérieures." v. Michel (11) describes in addition to the usual findings a "perithelial proliferation" and gives a drawing showing a condition not unlike that which we have found. Likewise Stieren (17) noted that "the walls of the blood vessels were uniformly rich in spindle connective tissue cells. Those which ordinarily should be of capillary type had an adventitia one to two cells broad. In short there was a general hyperplastic condition of the cutaneous vessels with marked increase in their number." There can be no doubt that along many of the vessels the appearance is produced of a perithelial (adventitial) rather than an endothelial

proliferation, but the fact that these cells in places form a definite syncytium with the endothelium, and that amongst them one finds many new formed and forming capillaries leaves little doubt as to their endothelial origin.

We have, then, in this case a diseased condition of the endothelium of the capillaries and venules, manifesting itself in a swelling and proliferation of the endothelial cells. There is, of course, no proof that this is the underlying cause of the whole pathological picture, but it is natural to suppose that endothelium so diseased might exhibit an altered permeability, and might thus by impairing nutrition engender the atrophy and œdema of the epithelium and corium that has been so frequently described. Some additional weight is given this supposition when one remembers that blepharochalasis has been known not infrequently to develop after repeated attacks of angioneurotic œdema. The latter has, at any rate, been generally assumed to be a vascular or vaso-motor disturbance.

v. Michel (11) believes that the pathology of blepharochalasis relates it to so-called "acrodermatitis progressiva chronica," (Herxheimer and Hartmann (20)), in which he quotes Rusch (21) as describing a combination of chronic inflammation and atrophy. In our case there was not the slightest evidence of any chronic inflammation though the endothelial proliferation might conceivably be mistaken for a perivascular infiltrate. We have not had the opportunity to examine sections of skin showing acrodermatitis progressiva chronica and cannot, therefore, venture to guess whether the same pathological picture exists in that condition.

BIBLIOGRAPHY.

1. Ayers, W. McL. *Lancet Clinic*, Dec. 13, 1913.
2. Bach. *Arch. f. Augenheilk.*, v. liv., p. 73.
3. Black. *Ann. of Ophthalmology*, v. xxiv., p. 404; v. xxv., p. 399.
4. Boyd. Abstracted in *Ophthalmic Year Book*, 1916, v. xiii., p. 297.
5. Dalen. *Mittheilungen aus der Augenklinik des Carolinischen Medico-chirurgischen Instituts zu Stockholm*, 1902.
6. Fehr. *Centralbl. f. prak. Augenheilk.*, 1898, v. xxii., p. 74.
7. Fuchs. *Wien. klin. Wochenschr.*, 1896, No. 7.
8. Lodato. *Arch. di Ottalm.*, v. xi., p. 42.
9. Loeser. *Arch. f. Augenheilk.*, 1908, v. lxi., p. 252.
10. v. Michel. *Berliner Ophthal. Ges.*, Sitz. 5, 1906, I., 18.

11. v. MICHEL. *Graefe-Saemisch Handb. d. gesamt. Augenheilk.* 2nd Ed., v. v., Part 2, p. 130.
12. RANDOLPH. *Trans. Amer. Ophthal. Soc.*, 1916, v. xiv., Part 2, p. 518.
13. ROHMER. *Arch. d' Ophtal.*, July–Aug., 1900.
14. ROLLET and GRENET. *Cliniques Ophtal.*, v. xix., p. 535.
15. ROSENSTEIN. *Berliner Ophthal. Ges.*, Sitz. 5, 1902, II., 27.
16. SCRINI. *Arch. d' Ophtal.*, v. xxvi., p. 440.
17. STIEREN. *Trans. Amer. Ophthal. Soc.*, 1914, v. xiii., Part 3, p. 713.
18. WEIDLER. *Trans. Amer. Med. Assoc., Section Ophthalmology*, 1913.
19. WEIDLER. *N. Y. Jour. Med.*, v. xvii., p. 468.
20. HERXHEIMER and HARTMANN. *Arch. f. Dermat. u. Syph.*, lxi.
21. RUSCH. *Arch. f. Dermat. u. Syph.*, lxxxi., p. 3 and 313.

THE THERAPEUTIC USE OF UVEAL PIGMENT IN SYMPATHETIC OPHTHALMIA.[1]

By Drs. ALAN C. WOODS, Baltimore, and ARNOLD KNAPP, New York.

(From the Department of Pathology and Bacteriology, Johns Hopkins Medical School, the Department of Ophthalmology, Johns Hopkins Hospital, and the Herman Knapp Memorial Hospital, New York.)

THE basic clinical points thus far emphasized in our work (1) (2) have been these. 1. That the occurrence of an immunity against uveal pigment protects against the development of sympathetic ophthalmia. 2. That the outbreak of sympathetic ophthalmia is dependent upon an existing hypersensitiveness to uveal pigment. If these two fundamental points hold true, as it appears they do, they point at once to two very definite measures, preventative and therapeutic procedures, as regards sympathetic ophthalmia. The two measures are these. 1. As a preventative or a prophylaxis against sympathetic ophthalmia, the obvious procedure is to remove the hypersensitivity and produce the desired immunity. 2. As a therapeutic measure, to remove the one factor which appears essential to the outbreak of sympathetic ophthalmia and to substitute for it, the one factor that appears to make sympathetic ophthalmia impossible; in other words again to remove the hypersensitiveness and produce an immunity to uveal pigment.

With the use of uveal pigment as a prophylactic measure we have had no experience. The case reported below is also the only instance in which we have used the pigment as a

[1] Presented before American Ophthalmological Society at Washington, May 3, 1922.

theraputic agent. It may be stated frankly that insomuch as this work is scarcely out of the experimental stage, that we felt considerable reluctance in using uveal pigment in man, knowing a hypersensitivity to it existed, unless the circumstances surrounding the case were such as to make any procedure that offered the least hope, justifiable. The case below reported more than filled these conditions. Before any injections were made, Professor Hans Zinsser was good enough to consult with us, and it was only after this final consultation that the procedure was undertaken.

REPORT OF A CASE OF SYMPATHETIC OPHTHALMIA.

The patient was a boy, aged 8, who was seen on September 10, 1921, with an unhealed corneal ulcer with prolapse of iris in a dense scar occupying the lower half of the right cornea, the result of a gonorrheal conjunctivitis, which began three months previous. Vision was reduced to light perception and the tension was increased. The attempt to preserve the eye seemed justified; on September 13th an iridectomy was done upward, the defect in cornea was curetted, the prolapsed iris removed as well as possible and the corneal wound was covered with a conjunctival flap. This healed and patient returned to his home after two weeks with vision of $\frac{2}{200}$.

He returned on October 31st, because the other (left) eye had become red three days before. The left eye showed slight ciliary congestion, posterior corneal deposits, posterior synechiæ. V. $\frac{20}{20}$. Tension n. Interior n. The right eye was white. V. $\frac{2}{200}$. The area of the corneal defect covered by a conjunctival flap was depressed and ocular tension was reduced.

There was no history of indigestion or overeating; urine was normal; stool showed evidence of intestinal fermentation, and the patient was placed on a sugar- and starch-free diet and high colon irrigations. The eye was given the usual treatment. November 7th, V. $\frac{1}{10}$; vitreous hazy; retinal veins engorged. November 9th, right eye enucleated. Serum reaction against uveal pigment was negative, showing no immunity whatever. A large cyanide subconjunctival injection was given; pilocarpine sweats and mercurial inunctions were begun. *November 14th*, atropine eczema. Left pupil contracting; nodules appearing in iris. Leukopenia 3000; no lymphocytosis. *December 8th*, V. $\frac{1}{10}$. Deep ant. chamber. Iris flat with nodules. Optic nerve

blurred, retina hazy. Non-specific protein therapy was started, a course of typhoid vaccine being given by Dr. Bonime. Though these were followed by the usual reactions, the leucocyte count did not increase and the eye continued to grow steadily worse. There was a marked follicular conjunctivitis with pseudo-membranes. The general treatment was then changed to salicylate of soda in large doses. The eye showed more and more the characteristic changes of sympathetic ophthalmia with nodules in the iris; peripheric retraction of iris; complete synechiæ and capsular opacity in the lens. January 5, 1922, the injections of uveal pigment were commenced. The progress of the eye disease did not seem to be particularly changed. Anterior chamber was shallow; pupil contracting; iris uneven, flat total adhesion; tension increased. January 18, 1922.—The eye was better; cornea and iris were clearer. T. 36. This improvement was only of brief duration and exascerbation occurred on February 2, 1922, when the eye became more red, harder, and there was more exudation in the anterior chamber and in the iris. On January 20, 1922, eight days after the course of immunization was completed, the serum reaction had become + +, almost complete fixation. Following the exascerbation of February 2nd the eye gradually improved, became white, and free from inflammation though lenticular condition remained about stationary; iris retracted with some anterior peripheric adhesions; capsular opacities. Tn. V. $\frac{20}{100}$. Details in fundus not visible. The blood examination on February 8th was + + +, showing complete fixation.

TECHNIQUE OF TREATMENT.

Procedure with Uveal Pigment.—The suspension of pigment used in the case was made up as before described (3) and preserved with 0.15% tri-cresol. Insomuch as the pigment is denaturized by heat, unheated pigment was given, the only step taken for active sterilization being the addition of tri-cresol, which is sufficient to destroy all ordinary non-spore forming pathogenic organisms. The critical condition of the case did not allow sufficient time to undertake animal experiments to exclude the remote possibility of the presence of tetanus spores. Therefore a precautionary intradermal test was made with tetanus antitoxin. This was positive, and the patient was desensitized with serum in the usual manner, and then given 1500 units of tetanus antitoxin. An intradermal skin test with uveal pigment was then made.

Technique of Intradermal Test (January 6, 1922). Three

different dilutions of the normal pigment suspension (the pigment of one cow's uveal tract to 7.5*cc* of salt solution is called "normal"), were used. The solutions were 1:100, 1:50, and 1:10. Using a fine hyperdermic needle small intradermal injections, sufficient to raise a bleb about one half the diameter of a dime, were made with each dilution on the flexor surface of the forearm. A control was made with 0.15% tri-cresol in normal salt solution. At the end of one hour the three belbs where the pigment suspension had been injected were surrounded by a striking, confluent, urticarial, weal, while the control was practically negative. Within six hours this urticarial reaction had disappeared. Since the patient was strikingly hypersensitive to uveal pigment, we at once proceeded with desensitization.

Technique of Desensitization (January 6, 1922.) Intramuscular injections in the buttock were made at two-hour intervals. The so-called "normal" suspension was used for the first four doses. The amounts given were 1.0*cc*; 1.5*cc*; 2.0*cc* and 2.5*cc*. For the fifth injection a suspension of twice normal strength was used, 2.5*cc* (the equivalent of 5.0*cc* of the normal) were given. There was no essential change in either the blood pressure, pulse, temperature, or respiration during this period of desensitization. The only change observed was a generalized urticaria with the resultant unpleasant itching. This was relieved by 70% alcohol rub, and entirely passed within sixteen hours.

Technique of Immunization. On January 6th, during desensitization, a total of 12*cc* of the normal suspension had been given, the last injection being the equivalent of 5.0*cc* of the normal. On January 9th, the equivalent of 7.5*cc* of the normal (condensed in a bulk of 2.0*cc*) were given by intramuscular injection in the buttock. On January 12th after a second three-day interval, the final injection, the equivalent of 10*cc* of the normal, was given by intramuscular injection in the buttock. Like the previous injection the pigment was condensed in a total volume of 2.0*cc*. No untoward symptoms accompanied either of the latter injections.

COMMENT.

Sympathetic inflammation after perforating ulcers is rare, although Peters (4) comments on the fact that sympathetic ophthalmia has been more frequently observed after perforation of a corneal ulcer complicating a gonorrheal process, and concludes the conditions in gonorrheal inflammation are more favorable to a development of sympathetic ophthalmia than

in other keratitides. As an operation was performed on some cases mentioned by him and it may be that the prolapse is not so dangerous as the operation which was undertaken to remove it. The operations performed in these cases (quoted from Peters) were excision of prolapse (Schieck, Brown), cauterization (Trousseau, Gifford, and Fuchs), abscission of corneal staphyloma and conjunctival suture (Fuchs).

In the above described case there seemed to be a definite intestinal autotoxæmia. No change in diet or treatment, however, was of any avail. There was no lymphocytosis. Recent investigations on the occurrence of lymphocytosis in sympathetic ophthalmia are negative. Treatment with nonspecific protein therapy was without avail. A leucocytosis could not be obtained.

Enucleation after onset of sympathetic ophthalmia was, as usual, without influence on the course of the iridocyclitis in the remaining eye.

Microscopic examination of the primary eye showed a characteristic diffuse infiltration of the iris and the adjoining iris angle, with mononuclear lymphocytes, a moderate infiltration of the ciliary processes and neighboring vitreous body, and only a few scattered foci in the choroid.

Inasmuch as partial recoveries have frequently been observed in sympathetic ophthalmia, irrespective of the form of treatment, the inflammation having exhausted itself, it is unwise to draw any definite conclusion from one case. In this patient, after desensitization and immunization, the clinical course, with one slight and short period of exascerbation, came to a standstill. The eye became white and free from inflammation and has so remained.

SUMMARY.

Uveal pigment was used as a theraputic agent in a case of sympathetic ophthalmia. The case occurred in a boy, aged eight years, following an operation for a perforated corneal ulcer, with prolapse of iris, occurring after gonorrheal ophthalmia. The inflammation pursued a steadily progressive course with all the symptoms of the severe type of sympathetic disease. All usual types of treatment—diet, intestinal

irrigations, pilocarpine sweats, mercurial inunctions, large doses of sodium salicylate, and non-specific protein therapy were without any effect.

The serum reaction to an antigen of uveal pigment was completely negative. The intradermal reaction to uveal pigment was strikingly positive, showing a marked hypersensitivity to pigment. The treatment with uveal pigment consisted in desensitization, followed by active immunization. After the immunization, the serum reaction against uveal pigment became strongly positive. Synchronous with this, with one short period of acute exascerbation, the inflammation in the eye subsided, the eye became white and has so remained.

The active process lasted for three months and has now been stationary for three months. Vision = $\frac{6}{60}$. The eye is white and free from imflammation but shows peripheric retraction, adhesion of the iris, and capsular opacities. Tension is normal.

BIBLIOGRAPHY.

1. Woods, A. C. "Immune Reactions Following Injuries to the Uveal Tract." *Journal of A. M. A.*, 1921, lxxvii., 1312–1321.
2. Woods, A. C. "The Diagnostic Use of Uveal Pigment in Injuries of the Uveal Tract." Archives of Ophthalmology, 1922, LI–451.
3. Woods, A. C. "Ocular Anaphylaxis IV. The Antigenic Properties of Uveal Pigment as Shown by Complement Fixation." Archives of Ophthalmology, 1917, xlvi, 503.
4. Peters. *Graefe-Saemisch Handbuch.* Hess III, Edition.

THE PLACE OF OPHTHALMOLOGY IN THE UNDERGRADUATE MEDICAL CURRICULUM.[1]

By Dr. W. GORDON M. BYERS, Montreal.

"In education, most time is to be bestowed on that which is of the greatest consequence in the ordinary course and occurrences of the life the young man is designed for."

Locke.

WHAT part of ophthalmology shall be taught in the undergraduate medical course? How much time shall be devoted to the subject? These are important questions; for in seeking to determine the place of ophthalmology in the undergraduate medical curriculum, one is faced at the outset, not only with the problem of what to do with the specialties in general, but also with the whole problem of undergraduate medical teaching.

A great deal of time and thought has been advantageously devoted in recent years to the subject of post-graduate ophthalmic studies, but apparently very little by comparison has been given to undergraduate work. The reason probably is, that the post-graduate studies present a circumscribed field that falls largely to teachers in the specialties for solution, while undergraduate studies in any one subject are but a single factor in a much larger problem, in which workers in all the branches of medicine are interested.

It seems a duty for ophthalmologists to take part in the widespread deliberations that are shaping the policies of all medical schools; especially so as some of the proposals that have been made in regard to the disposition of special studies are obviously

[1] Read before the American Ophthalmological Society, Washington, May 2, 1922.

founded upon a misconception of values and of the primary purpose of undergraduate medical education.

Before beginning the study of the problem we must set clearly before ourselves exactly what we wish to accomplish in undergraduate teaching. We still touch hands with those for whom it was possible in their college years to gain a fairly comprehensive grasp of the whole range of the medical knowledge of the time; but the phenomenal development of medicine during the last few decades has made this less and less attainable. Students are now forced to confine themselves to phases of the old major subjects, to subjects of recent development, and even, again, to ramifications of them. We have, in a word, witnessed an extraordinary development of specialization. The problem of undergraduate work is today, therefore, much more complex. Men aim not at one goal, but aspire to varied fields of endeavor.

As a starting point we must classify students in accordance with what they have in view. This is not a difficult matter, for quite simply our students fall into three groups: Those who are destined to be general practitioners; those who will be clinical specialists; and those who will specialize in research, teaching, and public health.

The specific business of the general practitioner is to treat sick individuals, in other words, to grapple with distinctive medical problems. Some of these problems are of little or no moment; others are of vital importance; and many of them are clearly beyond the scope of the general practitioner. It is obvious that in order to see clearly what are the requirements of the general practitioner in the way of instruction and training, we must set forth his problems and make some kind of classification in accordance with their relative values.

Clearly, the only standard of classification one can adopt in this field is the bearing problems have upon the preservation of life and of function. On this basis medical disorders can be instantly separated into those that menace life, and those that do not menace life. The second division, disorders that do not menace life, can be subdivided into disorders which threaten complete and permanent disablement, and those which do not threaten complete and permanent disablement. The first subdivision, disorders which threaten complete and permanent

disablement, includes two sets of conditions, those which call for immediate recognition and immediate and effective interference, and those which do not call for immediate recognition or immediate interference. The second subdivision, disorders that do not threaten complete and permanent disablement, embraces three classes; those which involve temporary disability but tend always of themselves to recover; those which do not involve temporary disability but cause discomfort in varying degree and lower efficiency; and those falling in the field of congenital deformities and cosmetics.

Although this classification is not intended for more than a suggestion, it yet suffices to throw into relief the relative importance of the disorders by which the general practitioner may be faced. But the classification covers the whole range of the problems of medicine and surgery; and since no man can at this day hope to master the entire subject, it must be determined which part of it the general practitioner can reasonably be expected to manage.

It is evident that the foremost place must be accorded to those disorders that carry with them a menace to life, namely, hemorrhages, suffocations, serious fractures, strangulations, virulent infections, poisonings, and cancerous growths. Scarcely less important are the conditions that lead to complete and permanent disablement, that deprive a man of his active life in society. No one will question the assertion that this state is regarded by mankind as among the great tragedies of life. Under these two headings are what may be called the major problems of medical practice. These problems vary in their degree of urgency, but they demand of the practitioner a knowledge so complete that it will express itself in immediate and fully effective action. Delay and partial recognition mean death and disaster.

On the other hand, it is equally clear that, in a field that cannot in any event be fully covered, the disorders that do not threaten complete and permanent disablement are those which should receive least consideration. At their head stand those conditions which are either extremely rare, or require for their management a training beyond the power of the student to acquire. These belong of necessity to the province of specialization. If we eliminate these, as we reasonably must, we

reduce the problems of our second division to a group made up largely of what we may call the minor ailments, that is, disorders which are neither menacing, complex, nor rare, but assume a certain importance because of the frequency with which they recur. In this minor field, then, and in the major field of menacing disorders lie the problems that fall with reason to the general practitioner.

The segregation of his problems in this way reveals the educational requirements of the general practitioner. A distinctive problem in the field of practice implies in a broad sense a distinctive scholastic task. We are able through our classification of medical disorders on the basis of what is of most importance, to design an undergraduate curriculum in accordance with the principle of what is of most worth. This principle requires on the one hand that the range of problems as determined shall shape the studies underlying their comprehension, and, on the other hand, that the amount of time and attention given to the mastery of a problem shall be proportionate to its importance as fixed. Major problems must always take precedence over minor problems, to the extent of entire neglect of the latter, if time be limited.

What applies to the design of the curriculum as a whole, applies to the individual studies. This answers the question as to what part of the subject shall be taught. The time devoted to a subject is to be determined in accordance with this decision. The place of a subject in the undergraduate medical curriculum, the place of ophthalmology, for example, will be proportionate to the number and character of the problems which fall to it from the whole number as determined. These conclusions lead us to see how illogical is the practice of devoting an equal amount of time to the specialties simply because they are so classified, instead of apportioning time on the basis of relative values. They also dispose of the proposal that the specialties as such should be entirely eliminated from the undergraduate curriculum, to the end that the whole time available may be devoted to the major subjects.

In illustration of what has been said let me indicate the disorders that must shape the undergraduate course in ophthalmology for general practitioners:

MAJOR PROBLEMS.—1. Disorders that menace life: intra-

ocular tumors; malignant growths on and about the eye; wounds and injuries of the orbit; orbital cellulitis and osteitis from extension, or metastasis. The student should have knowledge of, and be able to distinguish between, the various disorders, of which exophthalmos or proptosis is the most striking sign.

2. Disorders that do not menace life but are signals of disorders that menace life: optic neuritis, or "choked disk"; the various types of systemic retinitis and choroiditis; paralyses of the intrinsic and extrinsic muscles of the eye; visual disturbances expressive of disease in the optic tract.

3. Disorders that threaten complete and permanent disablement, and call for immediate recognition and immediate and effective interference: the purulent ophthalmias; trachoma; pterygium rarely; phlyctenular conjunctivitis; tubercular and diphtheretic conjunctivitis; ulcer of the cornea; interstitial keratitis, wounds, and injuries, and burns of the eye, including foreign bodies, or the field of industrial accidents; iridocyclitis, panophthalmitis; sympathetic ophthalmia; glaucoma; optic neuritis, of local origin, or axial; dacryocystitis; myopia.

MINOR PROBLEMS.—Sties, chalazions, marginal blepharitis, chronic catarrhal conjunctivitis.

It will be noted that, apart from numerous other harmless and rare conditions, one excludes from this list almost the whole series of cataracts and congenital anomalies. Implied, too, is but a limited acquaintance with the subject of muscular anomalies; and the operative field is highly restricted. On the other hand, the work demands a fair mastery of refraction, ophthalmoscopy, and perimetry in the functional examination of the eye.

If we were dealing solely with the ophthalmic course, the problem of how to present this work would not be difficult, but in undergraduate teaching we must view the matter from the standpoint, not of one but of all the subjects composing the undergraduate curriculum. Admitting that at the moment, and still more in the future as medicine develops, problems from the field of general practice must fall into the fields of specialization, when we come to include all that bear on general practice we are confronted by what is apparently a task of great magnitude. Nevertheless, this principle of what is of

most worth leads us to conclude that at any given time the maximum feasible achievement in the field as outlined shall be the minimum requirement in the way of a curriculum for general practitioners.

Now, professedly, the colleges undertake to cover this field; but we know only too well how far they fall short of meeting the requirements,—that there are annually graduated, in large numbers, men who are quite incapable of undertaking what should reasonably be expected of them in the field of general practice. I shall not now occupy your time with an analysis of the causes of this lack of success. Mainly it has been due to failure in recognizing the diversity of aims that has arisen; to efforts that have been made to develop unduly the purely educational aspects of medical studies; as well as to the introduction of "cultural" subjects that are clearly outside the province of a medical curriculum. The consequence of this confusion of ideals has been to graduate men on the one hand with an inadequate knowledge of important problems and of the subject as a whole; and on the other hand with an unnecessary knowledge of minor problems and of things outside the practitioner's field. Because of the insuperable difficulties of the curriculum, practical training has been neglected; facts have usurped the place of principles; and knowledge the place of education.

The consciousness of failure is a matter of concern and dissatisfaction to teacher and graduate alike; but behind the faculties and behind the practitioners is a third group whose interest in this matter has been apparently overlooked. In the end, medical education is a trust imposed on the schools and colleges of the country by the public, and one does not need to put one's ear close to the ground to learn that there is discontent with the manner in which practitioners are being trained to deal with the emergencies that arise in the community. From every point of view, therefore, the situation demands redress.

A curriculum designed in accordance with the decisions that have been reached offers a helpful measure for the solution of the difficulties. Taking the practitioner's problems as listed we shall develop courses of study that will cover as nearly as possible, not only the field as a whole, but what the

student is expected to know of each individual problem. It is implied that at the beginning of each course the student shall be given printed notes or a synopsis of the work to be done. Assistance may be had from the different departments; but in the end everything is to be carefully considered and brought into conformity with a prearranged plan. This work ought really to be entrusted to a small group of men, vested with considerable authority; and I suggest that it would be helpful for them to think of the problems, not as belonging to the various fields, but rather to medicine and surgery—to the mother subjects—as indeed they do.

Particularly important is the fact that under a unified direction it would be possible through coördination to eliminate completely the wasteful overlapping that now prevails, as well in the primary as in the final subjects. This process should be extended to its logical limit, through subject and problem to phase and element. It ought to be determined at the outset, in every instance, when and by whom a subject of this kind is to be taught. Students should be required to master a problem as defined, once and for all, and having mastered it pass to something else. On completion, the scholastic tasks would be distributed among the various subjects making up the curriculum. It really does not matter who does the teaching, though expediency would probably demand the services of experts in the special fields.

While what I have said applies particularly to the clinical subjects, which must be regarded as the basis for any arrangement of a curriculum, it also holds for the primary subjects; for the function of all primary teaching is to build concepts for the clinical work. The great fundamental principles will be taught as before; but with a classification of problems on the basis of what is of most worth, there will come to the primary teachers a scale of values that will be most helpful, as clearly indicating where emphasis should be laid in their work of preparation. It is not to be expected that all this could immediately be effected. Many difficulties can be foreseen. Adjustments and readjustments would be necessary; but eventually, with not one but many centers participating, there would develop a more or less standardized curriculum, which might be universally adopted.

But the adoption of a minimum medical curriculum implies certain specific obligations. One is, that the student must know everything of the subject as presented. It will not suffice that he recognize but two out of four essential problems; that he know but half of what is expected of him to learn of any one problem. This suggestion demands a very thorough system of examination, under which accurate and continuous records are kept of the work the student has done and the success with which he has done it.

A second and equally important obligation is, that if a specified task is set the student, the subject must be fully and systematically presented to him. With exceptions, of course, clinical instruction in medicine is still largely and generally of a haphazard character and based on chance. By this I mean that in many clinics cases are used for teaching as they appear, without any thought of fitting them into a well defined curriculum. The practice is largely the outcome of a want of clear conception of the field to be covered. The result is, that the students either do not see examples of disorders with which they should be familiar, or that the subject may be presented a quite unnecessary number of times. All clinical teaching should, from the outset, be brought into strict alignment with courses previously defined. This second obligation has also a very important bearing on the existence of a college; for no school is justified in carrying on clinical teaching, if the community in which it is situated is not sufficiently large to furnish clinical material of the right kind in adequate amount.

But if, in its application, the principle of most worth brings a more circumscribed, yet equally comprehensive curriculum, it demands on the other hand a more thorough practical training. Granting that the most is made of the facilities afforded by the dissecting room, the post-mortem room, and operative courses on the cadaver (and it is not), we are bound to admit that attendance on hospital work as now generally practiced does not produce satisfying results. Training to be effective must be much more intimate. There is daily evidence of the rapidity with which graduate internes are trained to deal competently with problems that are entirely beyond the scope of the man who leaves college immediately to enter practice. We must strive to secure for our students similar facilities in

their undergraduate years. The hospitals at present engaged in teaching could with advantage to the work of the institution add greatly to the number of internes; but when the limits are reached, a great field of opportunity for practical instruction remains.

Arrangements with non-teaching hospitals in college centers, as well as with numerous hospitals in centers which do not support colleges, could undoubtedly be made to share in the practical instruction of students. This means the training of the staffs of these institutions, who would then take rank as extramural teachers. The value of this enlarged opportunity for training to the colleges and to the student is apparent; and the benefit that would accrue to the community, through the raising of the standard of practice in this way, is scarcely to be estimated. The hospitals of the entire country might advantageously be utilized for this purpose. The suggestion implies in a broad and more modern sense a return to the old system of apprenticeship. Just how this idea would work out could not be determined until the curriculum as a whole had been developed. The main difficulty would be in arranging a plan of rotation. The housing problem would only be a matter of subsidizing the institutions to enable them to erect the necessary residences. Maintenance, in any case, would fall on the shoulders of the students.

More seriously to be considered is the objection that the work as outlined would occupy more time than men could afford. There is no reason, however, why theoretical instruction could not be concomitantly and even more advantageously carried on during the period of residence. Then, too, the time necessary to cover the field would be less than would first appear. Careful work in medicine paves the way for accurate diagnostic work in surgery, and the general training in surgical technique and procedure goes a long way to make easy the difficulties of the specialties. The general principles and the technique cover the whole field. Moreover, when one has mastered the major problems the minor problems present no difficulties.

Speaking for ophthalmology, I am satisfied that in the case of a man who has had a year of active work in general surgery, one could give him a satisfactory training in the course as outlined for general practitioners, in approximately four months'

whole time work, the necessary instruction in refraction and in ophthalmoscopy included. The ophthalmic operations falling to the general practitioner in accordance with the decisions formulated, are few in number including as they do only enucleation of the eye, exenteration of the orbit, drainage of the orbit, opening of lacrimal abscesses, styes, and Meibomian cysts, removal of foreign bodies from the cornea, cauterization of the cornea, and an iridectomy for the relief of glaucoma and for incarcerated iris. The last mentioned is the only one that presents any difficulties; but these could be largely overcome by practice on dead animals' eyes.

But before estimating what, if any, additional period is necessary for practical training, note should be taken of the saving of time that can be effected in various ways for this purpose by the utilization of time that is still largely wasted in attendance on operative clinics, the details of which are entirely indiscernible; by the ruthless exclusion of everything that is obsolete and trivial and irrelevant; but most of all by a rearrangement of the present curriculum as I have suggested, as well as by the introduction of more effective methods of teaching and study that grow out of this work. In the last analysis the argument calls for a matriculation standard that shall be no more than adequate if time demands consideration.

A few final words about undergraduate optional courses and specialization are now required. Under the plan as outlined, the scope of the curriculum would be much more sharply defined; and it ought to be possible, in a measure at least, to grade students and to permit the more brilliant among them to proceed to advanced work in optional courses after satisfying the faculties that they had mastered the information of a minimum curriculum.

But specialization in undergraduate years is unthinkable. The interdependence of the various systems of the body being so well established a fact, it is clearly impossible that a man could intelligently practice in any special field without a knowledge of medicine and surgery as a whole. The only guarantee against narrowness of view, the bane of specialization, is a broad theoretical training. On the other hand a general surgical training is the corrective for meticulous and careless methods in the special operative field.

Finally, from the point of view of public necessity—and that must always be the last court of appeal—it is not to be tolerated that men trained in limited fields of medicine shall be given the right to practise the art as a whole; for, there is no guarantee that men so trained will always succeed, or that later they may not wish to establish themselves as general practitioners. The only conclusion is, that men must qualify fully as physicians and surgeons before becoming specialists.

ILLUSTRATING DR. L. W. CRIGLER'S ARTICLE ON "A SIMPLE OPERATION FOR PTERYGIUM."

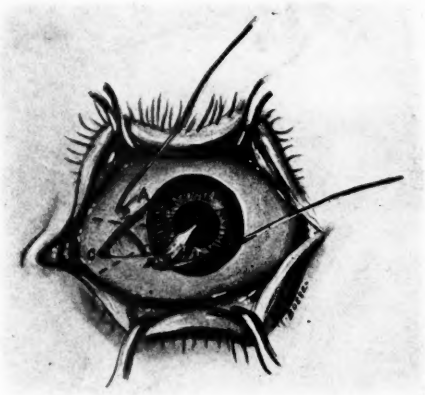


FIG. 1.

FIG. 2.

A SIMPLE OPERATION FOR PTERYGIUM.

By Dr. L. W. CRIGLER, New York.

(*With two illustrations on Text-Plate XXIII.*)

SUFFICIENT has already been written concerning the origin and histological structure of pterygia to make a further review of the subject at this time unnecessary.

Fuchs in his exhaustive investigation, has established the fact that the growth is never preceded by an ulcerative process, but that it is a hyperplasia superinduced by the irritation resulting from a pinguecula, a peculiar form of degeneration of the exposed ocula conjunctiva, adjacent to the cornea usually on the inner side.

Any encroachment of the conjunctiva on the cornea at any other portion of the periphery is due to corneal inflammation or ulceration, and this we classify as pseudo-pterygium.

With this knowledge clearly in mind it would seem that the only rational treatment must consist in not only a removal of the head of the pterygium, but the body as well, since it is this degenerated structure which precedes the development of the pterygium; also it would seem advantageous to divert from the interpalpebral space that portion of the conjunctiva immediately adjacent to the diseased structure removed, by drawing it down beneath the lower lid, thereby affording protection against subsequent degeneration and recurrence; and at the same time removing the line of union away from the interpalpebral space.

The operation to be described fulfills the above requirements and has other advantages which will be enumerated.

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[1] Read before the Section on Ophthalmology, New York Academy of Medicine, May, 1922.

Except for an occasional recurrence, all operations for the relief of small pterygia yield good results. Failure is usually due to faulty technique or improper post-operative care. The essentials of success in the operation to be described are:

First.—A thorough removal of the head of the growth from the cornea, from limbus to apex. (The slightest vestige of connective tissue left behind may proliferate and invite an ingrowth of newly formed vessels from the limbus, and thus become the starting point of recurrence).

Second.—Removal of the body of the pterygium and coaping the edges of the wound in such a way as to completely cover the underlying sclera, and unite the wound edges to each other, and to the exposed limbal border.

Third.—Tieing the sutures in a manner to prevent their cutting through the conjunctiva or coming untied prematurely.

Fourth.—Immobilization of both eyes a sufficient length of time to allow for primary union and epithelialization of the denuded corneal surface.

Until three years ago, the writer had been removing pterygia by Arlt's method as described by Meller; it was often found difficult to completely close the conjunctival wound on account of the tension put upon the limbal suture. It would be found frequently at the first dressing, that the suture had cut through the conjunctiva and left a wide surface of exposed, granulating sclera beneath. Again it was found that the sutures would be untied owing to the fact that both eyes were not bandaged, thus allowing free motility of the operated eye. With several recurrences to his credit, a means of relief was sought, and the operation as described below was adopted as fulfilling all of the requirements.

Grasp the neck of the growth with single fixation forcep just at the limbus; with a small narrow pointed knife make a small opening through the upper conjunctival edge of the pterygium immediately beneath the fixation forcep; without removing the fixation forcep make a corresponding opening below.

These incisions should be made just large enough to admit a small flat spatula or Paine's pterygium knife which is passed from the upper through the lower opening, and by blunt dissection the head of the pterygium is removed from the cornea.

If the underlying cornea is not transparent it is evidence that fragments of the growth have been left behind. With sharp scalpel or forceps and scissors, these should be removed.

The body of the growth is next slightly undermined, care being taken not to lascerate the normal conjunctiva at the upper and lower limbal margins. Subconjunctival tissue if abnormally thickened, is dissected from the conjunctiva and removed.

Then beginning at the upper limbal border, an incision downward and inward is made with a sharp pair of scissors, extending to about two or three *mm* of the lower border of the body of the pterygium; next, another incision is made beginning at the lower limbal border and extending inward horizontally to meet the incision from above at an acute angle. (See Figure 1.) All of the growth between these two converging lines is removed. The upper flap now made freely movable by careful dissection from the sclera is drawn down to cover the exposed sclera in the following manner:

Pass a suture through the middle of the upper conjunctiva flap, from without inward, to the limbus below (Figure 2). In placing this suture it is important that the needle be passed through the superficial layers of the sclera at the limbus before coming out through the conjunctiva, as in the advancement operation. This stitch draws the conjunctiva snugly up to the cornea and holds it there without overlapping it. A second suture placed half way between the inner angle of the wound and the limbal stitch, completes the operation. This latter stitch should not include the sclera in its grasp. It is a good plan to tie a third knot in the limbal suture to make sure of its not coming untied. To insure complete immobilization of the eyeball it is necessary to bandage both eyes, and this should be done for at least three days. This may appear trivial to those who have never had failure, but those of wider experience, who have, will appreciate its importance. It insures primary union of contiguous conjunctival raw surfaces and rapid epithelialization of the cornea; conjunctival epithelium blends with corneal at the limbus and the entire wound area is no longer exposed to irritation from without, and the process of healing is uninterrupted. Under such circumstances, recurrence is not to be expected.

The blood vessels in the flap drawn down from above are now directed beneath the lid; the line of union is removed from the intermarginal space, at the same time being covered and protected by the lower lid.

A paper describing an operation, identical in principle with the above, was written by Dr. Campodonico, of Lima, Peru, and printed in the pre-sessional volume of *An International Congress of Ophthalmology*, held in Washington, D. C., May 25 to 28, 1922. Dr. Campodonico did not appear to read his paper, however, and in as much as the operation performed by me differs essentially in the formation of the conjunctival flaps, and was conceived without any knowledge of his work, I feel justified in presenting it.

Dr. Campodonico's experience gained through a practice of his method, in a country in which a great many of the inhabitants are afflicted, has yielded him such uniform excellent results as to cause him to abandon all others. With my more limited experience, I can claim the same good results.

To recapitulate: The advantages of this method are as follows:

The operation is simple and easy to perform, the line of union is removed from the intermarginal space, and at the same time away from the denuded corneal epithelium; the sutures do not tend to cut through the conjunctiva as in the Arlt method, being anchored to the sclera beneath, which insures complete and constant closure of the wound, until firm union has taken place.

A bandage to both eyes for several days insures immobility to the traumatized area, a condition so essential to success after any operative procedure.

A CASE OF NEURITIC OPTIC ATROPHY IN A TABETIC, WITH A DISCUSSION OF THE VALUE OF THE DIFFERENTIAL PUPILLOSCOPE IN SUCH A CASE.[1]

By Dr. ARTHUR S. TENNER, New York.

(*With one figure in the text.*)

History.—The patient came to the Mt. Sinai Hospital, August, 1915, and complained of pains in back and waist. His knee jerks were absent. Romberg positive. Pupillary reactions normal. He had suffered from gonorrhœa some 20 years previous but denied lues. His Wassermann was 4 plus.

In the course of these seven years, he has received 29 salvarsans, and 108 mercury injections. A blood examination, made Nov. 15, 1921, gave a negative Wassermann. The spinal fluid, examined June, 1922, was negative in every respect.

Present status, May 15, 1922.—His vision never troubled him, and it was purely by accident, that I discovered the secondary atrophy about one month ago, in the course of examining a series of luetic cases with the differential pupilloscope.

By the ordinary methods of examination, his pupils reacted to light, the left very well, the right a trifle sluggishly. No anisocoria, or irregularity of shape. Convergence R. good. Yet the figures obtained by pupilloscopic methods showed a distinct lowering from the normal.

It would be beyond the province of this article to give a detailed account of the workings of the differential pupilloscope. Hess (1), Groethuysen (2), and Barkan (3) have done this,

[1] Read before Section on Ophthalmology, New York Academy of Medicine, May, 1922.

and in a later more extended article, I hope to add my observations. A few words of explanation, however, may not be amiss. Hess, realizing the inadequacy of the ordinarily used methods of testing the reaction of the pupil to light and the uncertainty of the conclusions drawn therefrom, differing in the same case often with the judgment of different observers as to whether a reaction is normal or slow or sluggish, and knowing also, as all clinicians know, that these so-called sluggish reactions are frequently physiological, whereas many that would be called normal by most observers are frequently pathological, has devised an instrument which he called the differential pupilloscope. In the application of this instrument, a known quantity (the varying intensity of the light) is used and while the excursions of the pupil are not actually measured, the sensitivity of the iris to lights of varying intensity is. Hess termed this, the "motorische Unterschiedsempfindlichkeit." Barkan translated Hess's term as discriminative acuity but I prefer the term sensitivity, to acuity, as closer to the meaning of "Empfindlichkeit." In addition the term acuity is so closely associated with vision, that it may be misleading.

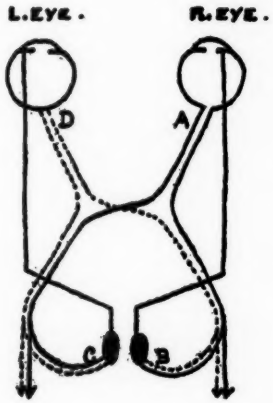
Just as we have been in the habit of testing the direct, and the indirect, or consensual reaction, so the direct and consensual motor discriminative sensitivity is tested and an exact mathematical figure is obtained, which in normal conditions of the retina, optic tract, motor oculi fibers, and nucleus is 0.9 both for the direct and indirect. Under 0.8 is pathological.

In this particular case, the figures obtained were as follows:

	Right	Left
Direct Motor Discriminative Sensitivity	0.55	0.65
Consensual Motor Discriminative Sensitivity	0.75	0.27

Let us analyze these figures in conjunction with the diagram. The figure 0.55 for the direct M.D.S. of the right, indicates a partial blocking of some part of the reflex arc either at A (a receptor or a fiber, lesion) or at B (a lesion of the intercalated fibers), *i.e.*, the connecting fibers between the optic tract and the nucleus of the motor oculi or at both A and B. Similarly the direct M.D.S. of the left eye is 0.65, indicating a

block at D or C, or at both these places. If there was a lesion at B and none at A or D, then the consensual M.D.S. of the



right eye would be equal to the direct M.D.S. of the right eye. But the consensual M.D.S. of the right is 0.75 *i.e.* 0.2 higher than the direct M.D.S. (0.55) of the right. Therefore, there must be a block at A greater than the block at B. This is confirmed by the low consensual M.D.S. of the left eye (0.27), more than 0.3 lower than the direct M.D.S. of the left, indicating a considerable degree of blocking at A.

The ophthalmoscopic picture confirmed this for it disclosed a marked secondary atrophy of the right disk, with a far less advanced atrophy of the left. The latter still retained some pinkness and the vision of this eye was $\frac{20}{60}$, accordingly we may infer a definite and decided block at A and a slight or no blocking at D.

Ophthalmoscopic examination.—Right—nerve head grayish, margins blurred, excavation and vascular funnel filled up, blood vessels obscured at spots. Left—Disk is pinker in color, but also shows blurring of margins, and covering of face of disk with organized exudate. Fields—Right contracted concentrically to 30 degrees. Left contracted concentrically to 30 degrees. Vision—O.D. $\frac{20}{200}$—O.S. $\frac{20}{60}$. The diagnosis of a neuritic atrophy of the optic nerves is indisputable.

I wish to call attention to the fact that even without an ophthalmoscopic examination, I was able by means of pupilloscopic measurements, to differentiate and localize three and possibly four lesions of the reflex arc, that is at A (a receptor or a fiber lesion), at B and C, lesions of the intercalated fibers and a doubtful one at D. In other words in the presence of an optic atrophy, an Argyll-Robertson pupil was diagnosed.

The neurological report is as follows: Romberg positive, absent knee jerks, absent Achilles tendon reflex, loss of sense of position. Disturbances of the vibratory sense in legs, testicular hypalgesia, ulnar hypalgesia in both arms. Girdle sensation in upper part of the thorax. Pupillary light reflex present. Diagnosis unquestionably tabes.

This array of characteristic symptoms, convinced the neurologist, that this was an undoubted tabes, but he was somewhat puzzled at the retention of the pupillary light reflex in such a characteristic case.

The Argyll-Robertson phenomenon is present in this case, but only to such a degree that by ordinary methods it does not disclose itself whereas as I have shown, by means of the differential pupilloscope it is revealed, and this in the face of the presence of an additional lesion, that is, an atrophy of the optic nerve.

The secondary atrophy of the optic nerve points to a cerebral lues. Is the spinal condition a true tabes, or a process similar to the brain condition (a spinal lues or a pseudo-tabes)? The latter assumption is not tenable. The persistence of the symptoms after seven years of anti-luetic treatment and the grouping of so many characteristic signs of tabes are against such an assumption and speak for a true tabes.

The coexistence of a tabes with cerebral syphilis may occur, according to Nonne (4), who has found this combination in section, in cases that were also observed clinically. The combination of papillitis, or secondary optic atrophy with tabes, has been reported. Igersheimer (5) reports his case in detail: In 1904 the papillæ were reddened and blurred. No evidence of tabes at this time. In 1915, the right papilla was definitely atrophic with blurred margins; the left disk had also blurred margins, but normal color. At the same time, the neurologist declared the case one of tabes. In 1917 he had the

good fortune to see this case again. Then both nerve heads were white but the left still had very slight pinkishness. Both margins were blurred and on the right papilla, with the Gullstrand Ophthalmoscope, a definite cloudiness was visible. The neurological examination disclosed an unquestionable clinical tabes.

(There is a rather curious resemblance of my case to that of Igersheimer's, in that, in both, the right papilla was more seriously affected).

Igersheimer is in doubt as to the classification of his case. At first, he was inclined to the diagnosis of a tabes with a complicating cerebral lues or a pseudo-tabes. Later, he was more inclined to believe that the case was a true tabetic atrophy, in a case with a congential anomaly of the papilla (blurred margins with cloudiness), (a rather fantastic assumption it seems to me).

Rendu (5) reported a case of clear-cut tabes in which appeared a papillitis, retinal hemorrhages, and vitreous clouding. These cleared up under antiluetic treatment, while the tabetic symptoms and signs persisted, in fact increased.

A similar case was observed by Bernhardt, also one of Mendel and Shuster (5).

REFERENCES.

1. C. v. Hess. "Das Differential Pupilloskop." *Arch. f. Augenheilk.*, 80 Bd., 1916.
2. Groethuysen. "Ueber die Beziehungen zwischen motorischer und optischer Unterschiedsempfindlichkeit bei normalen und krankhaften Zustanden des Sehorgans." *Arch. f. Augenheilk.*, 87 Bd., 3 und 4 Heft.
3. Barkan. "The Differential Pupilloscope." Archives of Ophthalmology, vol. li., No. 1, 1922.
4. Nonne. "Neuro-Syphilis."
5. Igersheimer. "Syphilis und Auge."

BILATERAL DETACHMENT OF THE RETINA IN NEPHRITIS OF PREGNANCY. RE-ATTACHMENT OF RETINÆ.

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(OPHTHALMOLOGICAL SERVICE, DEPT. MEDICINE, YALE UNIV.)

SINCE the appearance of the excellent article by Dr. C. A. Clapp in the July issue of *The American Journal of Ophthalmology*, entitled, "Detachment of the Retina in Toxæmia of Pregnancy," I have been on the lookout for such cases. While the literature upon this subject is small and little mention is made thereof in textbooks, the belief that such cases are not so rare is substantiated by the finding of one more such and its report appears justifiable.

J. M., Italian, multipara, age 31, entered the New Haven Hospital on March 9, 1922. Her family history was negative as to cardiac, renal, or tuberculous disease. She had never had scarlatina, rheumatic fever, or other infectious disease and there was no history of heart trouble. She had had, however, a nephritis during her first pregnancy, which terminated in September, 1914. In January of 1916 she was again delivered, but by a midwife and there is no evidence of nephritis during this pregnancy. Since the last confinement she has had two accidental abortions at the end of the second month.

The patient was seven months pregnant when she entered the hospital. Until within three weeks her health had been good but at that time she had been confined to her bed for a week with cold, sore throat, fever, etc. Two weeks previous to admission her feet, ankles, hands, and eyelids had begun to swell. She had had slight headaches for the past week and occasional obscurations of vision. There was some polyuria but no faintness or dizziness. The symptoms

enumerated had caused her attending physician to send her into the hospital.

Physical examination on entrance showed moderate œdema of eyelids, hands, and abdomen and marked swelling of the legs. She could read fine print without difficulty and had no complaint except of feeling weak. Her blood pressure was $\frac{210}{140}$, but had dropped to $\frac{150}{110}$ within six hours, only to rise again later. The urine was brown, cloudy, 1.018, albumin 14*gms* per liter, granular casts 4–7 per field. White count 17,050, Hb. 74%, Wassermann negative. The fluid intake for the first day was 6400*cc* and output 1800*cc*. A tentative diagnosis was made of pre-eclamptic toxæmia, probably nephritic.

On the evening of the day of admission the patient complained of slight headache and marked impairment of vision in right eye. (L.P. but cannot count fingers.) Vision in left eye was apparently not involved. Venesection was done next day—400*cc*—and blood pressure dropped to 190. Because of the gravity of the patient's condition it was deemed necessary to terminate labor and a Voorhee's bag was inserted into the uterus on the evening of the second day of hospitalization. A stillborn baby was delivered the next morning.

The day following the delivery blood pressure was $\frac{210}{140}$, fluid intake 2000*cc* and output 1450*cc*. There was a noticeable decrease in the œdema. On the eleventh day a kidney function test (phenolphthalein) showed 19.87% elimination in two hours. This improved to 38% during the next week. The amount of albumin in the urine decreased slowly but showed a faint trace on discharge, March 29th, twenty days after entering the hospital.

I was requested to examine the eyegrounds of the patient on the day after admission. The fundus of the right eye was obscured in all parts except the lower nasal portion, by a large sacculated detachment of the retina. The small portion not detached appeared to be normal and no hemorrhages or exudate could be made out in any part of the retina. Vision in the right eye was reduced to light perception in the lower nasal field, and counting fingers in the left eye (patient very drowsy). The detachments extended far forward and could be seen by oblique illumination.

The day following this examination there was no change, but upon the fourth day there was a noticeable decrease in size of the detachments and they had changed position in each eye, being now in the lower portion of the retina and becoming re-attached above. There was a steady improvement in the condition, that is a decrease in size of the detachments. On the seventh day the separation was very slight

in extent in the right eye, the nerve head now appeared œdematous and a small whitish patch of exudate was seen up and nasalward. The left, originally better eye, now showed more detachment than the right, but decreasing steadily. There was also a patch of exudate down and out. The arteries were paler than normal. On the ninth day no detachment could be made out in either eye but perivasculitis and irregularity of outline of the arteries was more marked. The patient was able to read coarse print. The fundus picture was practically as above at the time of discharge.

On April 7, 1922, one month after the beginning of the retinal separation the patient was examined at the office and the following conditions noted: The pupils were equal and media clear. The right nerve was blurred in outline up and in and one small hemorrhage was seen in the nerve fiber layer, down and out from the nerve. There was also a slight exudate still farther out. The veins were full and were indented by the arteries, which showed sclerosis and perivasculitis. The left nerve was blurred below and nasalward and there was a patch of exudate up and in from the nerve. Vision in the right was $\frac{2}{3}\frac{0}{0}$ and in the left $\frac{3}{1}\frac{0}{0}\frac{0}{0}$ plus. The field of vision was of normal extent in the right eye and normal in all directions in the left except above, where it was constricted to about 10 degrees. No detachments could be made out through a widely dilated pupil.

No direct treatment was given to the eyes at any time, except the use of homatropine daily to keep the intraocular muscles at rest.

The case presented is interesting because of the rapid onset, its bilateral character, and its rarity. The patient did not develop eclampsia so that we must conclude, in view of the blood and urinary findings, that the detachments were only one expression of the marked œdema, due to impaired kidney function. As Clapp has pointed out, such detachments are undoubtedly more frequent than reports of the same and if all pregnant women with evidences of defective kidney elimination, especially with visual disturbances, were examined frequently, through dilated pupils, detachments, particularly when small and peripherally situated would be encountered. The serious general condition of the patients often causes the examination of the eyeground to be neglected, except in well organized hospital services.

Retinal detachment in pregnancy was first described by Albrecht von Graefe in 1855. In 1902 Heilbrun (3) collected 20 cases, including one observed by himself, while in 1921 Schiötz (42) found reports of 50 cases, including 7 of his own and the 6 cases of Clapp (38). Apparently my own case, detailed above makes a total of 51 examples of this interesting condition to date.

The detachments are seen usually in the later months of pregnancy and are rather more frequent in primiparæ, perhaps because of their less advanced age, and emmetropic eyes are quite as liable to suffer as the myopic. Most of the women develop eclampsia but not all, and the detachments are usually globular and situated in the lower part of the retina, but total separation has been noted. The very great majority of the cases are bilateral and re-attachment after the delivery of the child is the rule.

Cases in which the detachment occurs some weeks after delivery of the child, in women suffering from a severe chronic nephritis and who usually succumb within a few months, are not properly placed in this class of retinal detachments of pregnancy.

Foster Moore (39) reports 13 cases of retinal detachments in renal retinitis, 5 of them occurring in pregnant women; of these latter, 3 suffered from chronic nephritis before pregnancy began and died before full term and must therefore be considered as examples of detachment complicating chronic nephritis, the latter being aggravated by pregnancy. In these cases re-attachment of the retina did not occur.

Ingolf Schiötz (42) has made a most exhaustive and interesting study of this whole subject, the results of which are published in an article of 136 pages. He gives an historical review of the subject of eye findings during pregnancy, discusses the urinary and blood changes, and adds observations on cases of his own. The paper is divided into three parts, (1) the retinitis of pregnancy, (2) eye findings in eclamptic cases, (3) eclamptic amaurosis. His conclusions are based upon the study of the eyes of 6800 pregnant women, seen during five years. In this large series he found seven cases of detachment of the retina in eclamptic women.

Four of Schiötz's cases of detachment showed signs of renal

retinitis while in three of them retinitis was lacking, thus disproving the belief of Moore that the retinitis is an essential concomitant to the detachment. These three cases were eclamptic primiparæ who showed no nephritis preceding pregnancy and one must look, therefore, for the contact point between retinal detachment and nephritis in the pregnancy itself. In two of these patients the detachments were unilateral and have remained stationary in the years which have since passed. One must admit, of course, the remote possibility of the existence of the detachment previous to the pregnancy. The prognosis of retinal detachment, even without retinitis, is, therefore, not uniformly good.

In the 4 cases of Schiötz of detachment associated with retinitis the retina re-applied itself from four to six weeks. Improvement began immediately after the delivery of the child and re-attachment was complete within a few weeks post partum.

As to the immediate cause of the detachment, opinions differ. Moore feels strongly that the detachment is always associated with a retinitis and is due to the latter. In this view Schiötz does not concur. Moore reports on the examination of 91 soldiers suffering from an aggravated form of chronic nephritis without retinitis and none of whom developed a detachment, while on the other hand, of 13 cases of detachment all suffered from retinitis. He concludes that the subretinal exudate, liquid or solid, or partly both, is derived from the retina alone and in this Schiötz disagrees, believing that the choroid plays the essential rôle. Verderame (20) examined histologically the eyes of a patient who died from cerebral tumor some years after the occurrence of bilateral detachment during pregnancy. Her vision had recovered to $\frac{6}{9}$. He remarks upon the extreme sclerosis of the choroidal vessels and points out that the other changes were slight. He believes that the important changes are in the choroid and not in the retina. That the detachment is not merely a part of the general œdema is proved by a study of Schiötz's 7 cases, 2 of whom showed severe general œdema with puffiness of the face and œdema of the ankles, 3 showed slight puffiness of the face and œdema of the ankles, and in 2 no œdema was present. In my own case the œdema of the face, hands, and ankles was

severe. The real cause is probably a primary fluid collection beneath the retina, not necessarily a part of a general œdema, but produced by the same little understood factor in a tissue which is anatomically vulnerable to separation.

The prognosis as to vision is good but the great majority of the patients do not regain normal sight. This is due rather to the retinitis generally associated with the detachment and results from the destruction of retinal elements and not from retinal separation. Proof of this is seen in the fields of vision, which are usually contracted but in which the blind portion does not correspond to the previously detached part of the retina.

At least one case has been recorded in which a later pregnancy has supervened without a repetition of the detachment. In fact it is conceivable that the re-attached portion of the retina may be more firmly adherent than the normal retina, due to the organization of the subretinal fluid which is often rich in cells.

As to the treatment of the condition there seems to be no question but that the delivery of the child at the earliest moment is indicated. It is possible, as mentioned by Clapp, that withdrawal of the spinal fluid may be desirous.

We may therefore conclude that retinal detachment in the nephritis of pregnancy is usually but not always bilateral, occurs generally in association with signs of renal retinitis but at times with no evidence of the latter, tends to spontaneous re-attachment in the great majority of cases and this within from 2 days to 6 weeks after the delivery of the child.

I am indebted to Dr. Arthur H. Morse, Professor of Obstetrics and Gynecology, upon whose service the patient entered the hospital, for the opportunity to study this case.

BIBLIOGRAPHY.

(NOTE: Some of these references concern retinal detachment of nephritis in other conditions than pregnancy but seem of sufficient interest to include here.)

1. NORDENSEN. *Die Netzhautablösung.* Wiesbaden, 1887.
2. KUNZ. Dissertation, Marburg, 1897.

3. HEILBRUN. "Über Netzhautablösung bei Schwangerschaftsnephritis," *Berl. klin. W.*, 1902. S. 69 u. 103.
4. NETTLESHIP. *R. L. O. H. Reports*, vol. xvi. Also *Trans. Ophth. Soc.*, vol. xix, *R. L. O. H.*, vol. xv., p. 329.
5. SCHLESINGER. Quoted Parson's *Pathology*.
6. GALEZOWSKI. *Ibid.*
7. WILSON & HIRD. *Lancet*, July 17, 1909, p. 146.
8. HAHN & KNAGG. *Lancet*, May 18, 1901, p. 1391.
9. GOURFEIN-WELT. *Recueil des travaux X Congrès intern. d'opht.*, Lucerne, Sept., 1904, p. 33.
10. GOLDZIEHER. *Die ophth. Klinik*, Feb. 20, 1900.
11. ROEMER. *Textbook of Ophth.* (Foster's Translation.) 1913, p. 755.
12. WEST. Lettsomian Lectures, 1900.
13. ANDERSON. *Trans. Ophth. Soc.*, vol. viii., 1888, p. 141.
14. SINCLAIR. *Jour. Pathol. & Bact.*, June, 1901, p. 294.
15. UTHOFF. Heidelberg Congress, Sept., 1903, p. 4.
16. JONES. *Jour. A. M. A.*, Jan. 23, 1913, p. 334.
17. SAWYER. Birmingham *Med. Rev.*, 1903, p. 566.
18. JAMES. *Ophth. Review*, vol. xxxii., 1913, p. 164.
19. EASON. *Trans. Ophth. Soc.*, xxiv., 1904.
20. VERDERAME. "Über nichtalbuminurische und albuminurische Netzhautablösung und ihre Wiederanlegen bei Schwangeren." *Kl. M. f. A.*, Bd. 49, S. 452.
21. SCHWEIGGER. ARCHIVES OF OPHTH., 1882, p. 456.
22. SYM. *Ophth. Record*, vol. xxxii., 1913, p. 293.
23. GREENWOOD. *Ophthalmology*, Jan., 1905, p. 8.
24. SOUTHEY. *Lancet*, Jan. 13, 1883, p. 47.
25. WADSWORTH. *Trans. Amer. Ophth. Soc.*, 1887.
26. FISHER. Proceedings R. S., for July 1915, p. 142.
27. SCHERENBERG. "Ein Fall von doppelseitiger Netzhautablösung mit Drucksteigerung bei Retinitis alb. gravid." *Kl. M. f. A.*, 1905, ii., S. 31.
28. ADAMÜK. *Westnik. Ophth.*, 1882, p. 456.
29. v. HIPPEL. *Ophth. Geschellschaft*, Heidelberg, 1908, p. 362.
30. HAGG. *Lancet*, June 12, 1875, p. 824.
31. COLLINS. *Trans. Ophth. Soc.*, vol. viii., p. 129.
32. DAVIDSON. *Ibid.*, vol. i., 1880, p. 57.
33. QUINLAN. *Ibid.*, vol. i., 1880, p. 58.
34. DICKINSON. *Diseases of the Kidney*, 1877, p. 546.
35. WEEKS. *Diseases of the Eye*, 1910, p. 482.
36. LANGDON. *Trans. Coll. of Physicians*, Phila., vol. xxxv., p. 429.
37. ROCHON-DUVIGNÉAUD. *Bull. et Mém. de la Soc. Franç. d'ophtal.*, 1912, p. 36.
38. CLAPP. *American Jour. of Ophthal.*, July, 1919.
39. MOORE, FOSTER, *R. L. O. H. Reports*, 1916, vol. xx., 11.
40. HIPPEL u. ADAMÜK. *Vers. O. G. Heidelberg*, 1908, s. 362.
41. KNAPE, ERNST. *Finska Läkareselskapets*, 1910, Bd. 52, S. 533.
42. SCHIÖTZ. I. *Kl. M. f. A.*, 1919, Bd. 62, S. 234.

43. STOEWER. *Zeit. f. A.*, 1917, Bd. 36. S. 314.
44. UDDGREN, GERDA. *Oegonklinik*, 1889–1908. *Hygeia.*, 1908, S. 887.
45. DEL ZOPO & SOLI. *Ann. di Ottal.*, v. xxxiii., 1904.
46. COHEN, M. *Trans. N. Y. Acad. Med., Ophth. Sect.*, March, 1914.
47. CALHOUN, F. P. *Jour. A. M. A.*, Oct. 15, 1921.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by Drs. A. N. Alling, New Haven; M. J. Schoenberg, New York; T. H. Butler, London; P. G. Doyne, London; and K. Wessely (*Archiv f. Augenheilkunde*), Würzburg.

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(*Continued from March number.*)

VI.—THE LIDS AND LACRIMAL ORGANS.

35. Dimitry, T. J. **Hereditary ptosis.** *American Journal of Ophthalmology*, September, 1921.

36. Gifford, S. R. **The ætiology of chronic meibomitis.** *Ibid.*, August, 1921.

37. Heckel, E. B. **Blepharochalasis with ptosis.** *Ibid.*, April, 1921.

38. Roesen. **Congenital ptosis.** *Deutsche med. Wochenschr.*, 1920, p. 1044.

39. Schmalfuss. **Mikulicz's disease and its treatment.** *Fortschritte Med.*, 1920, p. 145.

40. Schmid-Hellmuth. **Mikulicz's disease.** *Folia hæmatol.*, xxv., p. 71.

41. Stock. **Dacryoadenitis, bloody tears, streptothrix in the canaliculi.** *Klin. Monatsbl. f. Augenheilk.*, lxv., p. 416.

42. Wick. **A rare tumor of the lid (fibro-chondro-epithelioma).** *Ibid.*, lxv., p. 328.

Dimitry (35, **Hereditary ptosis**) found in five generations of a family of thirty-eight, twenty-one showing congenital ptosis. He prefers the term of blepharophimosis as the palpebral fissure is shortened and the upper lids stretched so that from one third to one half of the cornea is covered. This condition of undeveloped palpebral fissure demands different treatment from ordinary ptosis and he performed a canthoplasty with tenotomy of the palpebral ligament. Alling.

Roesen (38, **Congenital ptosis**) obtained a good cosmetic result in a case of congenital ptosis by Motais's operation, in spite of the fact that the upper lid contained a fairly large scar, resulting from a former excision of a portion of the skin. Motais's operation can be employed only when the innervation of the eye muscles is intact.

HECKEL'S (37, **Blepharochalasis with ptosis**) case is unique in that it was monolateral with complete ptosis. The eyelid was raised by excising an elliptical piece of redundant skin.

ALLING.

GIFFORD (36, **Ætiology of chronic meibomitis**) found from cultures that the bacillus xerosis and the staphylococcus were usually present in normal cases as well as in chronic meibomitis being present probably at the roots of the lashes. The smears showed either negative results or a varied flora. ALLING.

WICK (42, **Rare tumor of the lid**) reports finding in a man 28 years old a tumor of the lid which was diagnosed under the microscope as a fibro-chondro-epithelioma. Below the left canthus was a roundish tumor, 1*cm* in diameter, attached by a broad base to the skin, into which it gradually blended, and with which it could be freely moved about. The middle portion was somewhat rough, the skin over it fibrinlike and easily removed so as to reveal beneath it a dense, white tissue. The microscopic findings were: Great cell proliferations in loose connective tissue, partly in branched cords of cells with formation of hollow spaces. The cells were for the most part epithelial, not bound together in large masses. Hence the diagnosis of epithelioma. Some of the appearances, such as absence of connection with the skin and the presence of red blood corpuscles in two hollow spaces, were suggestive of endothelioma, but opposing this diagnosis were the age of the patient and the fact that a clear transition from normal to pathologically changed endothelium could nowhere be demonstrated. Nothing was found characteristic of carcinoma. Wick considers that it was probably a mixed tumor.

SCHMALFUSS (39, **Mikulicz's disease**) reviews the literature concerning this disease, which he considers sui generis, particularly when only such cases are considered as present the symptoms enumerated by Mikulicz. Only twelve of the reported cases does he consider as positively belonging in this category, while ten others are admitted as very probably belonging. The characteristic features of the disease are its chronic course, the absence of pain in the affected organs and their unimpaired function. Histological examination confirms the condition mentioned by Mikulicz of small cell infiltration of the connective tissue and degenerative processes in the acini.

The presence of giant cells, mentioned by many authors, almost certainly indicates a special disease. The absence of general symptoms is noteworthy; the blood is always normal, there is never any fever. The ætiology of the disease, which gives the impression of a chronic infection, is unknown; he thinks it is almost certainly an ectogenous infection. The disease is met with in all ages of life, usually sporadically. The only remedies suggested are arsenic and the X-rays.

SCHMID-HELLMUTH (40, **Mikulicz's disease**) reports three cases of this disease, considering mainly the blood picture. He says that the lymphatic elements show distinct deviations. In Case 1 there was relative lymphocytosis and lymphatic polymorphia; in Case 2 a diminution of the lymphocytes due to the destruction of the lymphocyte building organs. Perhaps a lymphogranulomatosis was present, as indicated by the tumor of the spleen and the failure of arsenical therapy. Case 3 had pseudoleucæmia. Relative lymphocytosis was absent, while the polymorphous condition of the lymphocyte elements was marked. The glossitis and stomatitis present were probably caused by lymphatic proliferation.

STOCK (41, **Dacryoadenitis, bloody tears, streptothrix in the canaliculi**) describes five cases of dacryoadenitis which began suddenly with great swelling of the lacrimal glands and the formation of abscesses. The pus contained pneumococci and staphylococci. No such disease as mumps or influenza was present. In a sixth case there was a bilateral swelling of the lacrimal glands with fluctuation. Incision revealed a granulation tissue which, when inoculated into a rabbit's eye, induced the typical iritis of inoculated tuberculosis. Microscopical examination of the granulation tissue showed typical tuberculous changes. The gland on only one side was opened, that on the other side recovered without treatment. He believes that tuberculosis of the lacrimal glands is more common than is supposed, that it is of hæmatogenous origin, and that it may recover spontaneously without special treatment. Stock traced the bloody tears seen in a girl 12 years old, to a little loop of vessels which could easily be made to bleed. The patient with streptothrix had the characteristic swelling of the canaliculi and some purulent secretion. Dilatation and cleansing of the canaliculi resulted in a cure.

VII.—THE ORBITS AND ACCESSORY SINUSES.

43. CHANCE, B. **Radium plugs for the dissolution of orbital gliomatous masses developing after excision of the globe.** *American Journal of Ophthalmology*, September, 1921.

44. CREMER. **A case of lymphangioma cysticum of the orbit.** *Zeitschr. f. Augenheilk.*, xliv., p. 65.

45. DESAX. **Plastic closure of fistulæ between the orbit and the accessory sinuses.** *Archiv f. Augenheilk.*, lxxxvi., p. 306.

46. FINNOFF, W. C. **Carcinoma of the orbit.** *American Journal of Ophthalmology*, April, 1921.

47. MYGIND. **Acute inflammations in the orbit originating from the accessory sinuses.** *Klin. Monatsbl. f. Augenheilk.*, lxv., p. 429.

48. WEINGÄRTNER. **Orbital abscess with panophthalmitis.** *Deutsche med. Wochenschrift*, 1920, p. 936.

49. WHEELER, J. M. **Restoration of obliterated eye socket.** *American Journal of Ophthalmology*, July, 1921.

50. WICK. **Bilateral phlegmon of the orbit and thrombosis of the cavernous sinus.** *Klin. Monatsbl. f. Augenheilkunde*, lxv., p. 335.

CHANCE (43, **Radium plugs for the dissolution of orbital gliomatous masses developing after excision of the globe**) made use of a number of slender plugs or needles containing 10*mg* of radium which were left in the gliomatous masses filling the orbits. After an exposure of twenty hours there was severe reaction but the new growth gradually disappeared and the child regained its health. As only a few months have elapsed since the treatment, it is yet too soon to determine whether the cure is permanent.

ALLING.

FINNOFF (46, **Carcinoma of the orbit**) removed five hard encapsulated tumors from the orbit which proved to be scirrhus adeno-carcinomata. From the history one might conclude that the tumor was primary in the orbit, in which case it could be explained on the theory that, in the development of the lacrimal gland, a portion became separated as an embryonic nest in the orbit developing malignancy later. The author, however, is inclined to believe that the primary growth existed elsewhere in the body. The patient died of malignant tumors in different parts of the body about a year after operation. Only seventeen cases of carcinoma of the orbit without involvement of the globe, lacrimal gland, or skin have been reported.

ALLING.

CREMER (44, **Lymphangioma cysticum**) reports a case of cystic lymphangioma of the orbit, enclosed in a strong connective tissue capsule, met with in a child 11 years old. The tumor, which was said to have originated from a blow, had always been painless. There was marked exophthalmos, restriction of movement of the eyeball, and swelling of the lids. The skin of the lid was yellowish black, and fluctuation could be felt. Vision was good, the X-rays negative. The clinical diagnosis wavered between dermoid and lymphangioma. The tumor was shelled out uninjured. Healing followed smoothly. At the time of discharge the lid was still lax, the eyeball still somewhat protuberant outward and downwards, its mobility slight, especially toward the nose. The inner wall of the cyst had a distinct lining of endothelium, the connective tissue capsule was markedly infiltrated with small cells, and about the vessels were nests of lymphocytes, but nowhere typical lymph follicles. In the cyst wall were small hollow spaces lined with endothelium. There was much smooth muscle tissue. Dermoid was positively excluded. The marked infiltration of the cyst wall and the presence of clots of fibrin in the hollow spaces indicated lymphangioma rather than cavernoma. The development of the lymphangioma is ascribed to an embryonal disturbance of development.

DESAX (45, **Plastic closure of fistulæ between the orbit and the accessory sinuses**) describes three cases, all due to shot wounds. In Case 1 a cicatrix of the upper lid was adherent to the bone and the lateral portion of the lid hung like a flap in the much shrunken orbit. There was only a cleft-like small conjunctival sac, in the medial portion of which appeared a large defect leading into the nose. The upper lid was separated from the scar and undermined, the aperture into the nose was then closed by conjunctiva dissected from the lower lid. The other portions of the conjunctiva were removed that granulations might gradually fill the cavity of the wound. The lashes were extirpated and the lids sutured together. A tampon was placed in the nose. The fistula was closed in about a month. In the second case the left eyeball was absent, both lids were drawn back into the orbit by cicatrices. Laterally in the conjunctival sac was a large defect which passed over into a fistula leading into the nasal cavity. The entire conjunctival sac was excised,

the remains of lid were undermined so that they could be well united. The lids when sutured together were pressed into the orbit by a tampon. Sixteen days later the fistula was closed. In Case 3 the right eye was absent, the lower margin of the orbit was wanting, there were large defects in both upper and lower lids, a very flat conjunctival sac, and below a fistula leading into the maxillary sinus. The X-rays showed obscuration of the maxillary sinus. The maxillary sinus was found to be almost completely gone, its remains to contain thickened mucous membrane. The lids were undermined, sutured after removal of the conjunctival sac, and healing was complete in a month.

WHEELER (49, **Restoration of obliterated eye socket**) has had an extensive experience with this operation. He makes a mold of dental compound, which softens with heat, and fits about this a thin skin graft of epidermis only. He cuts it from the thigh with a large razor. An extensive bed for the graft is obtained by dissection close to the lids, even to thinning of the tarsus, and well back into the orbital tissue. He also increases the size of the orbit by free canthotomy. He has not found it necessary to stitch the graft to the form, if it is smeared with vaseline. The form is then forced into the cavity and a tight pressure bandage applied which should be left in place for a week. This method gives a permanent socket extending well beyond the canthi and of sufficient dimensions to hold an artificial eye.

ALLING.

MYGIND (47, **Acute inflammations in the orbit originating from the accessory sinuses**) reports twenty-five cases, in most of which the ethmoid was primarily affected. The most important symptom is the exophthalmos. The swelling of the upper lid is not as characteristic. The differential diagnosis between a collection of pus in the orbit and a disease of the accessory sinuses is often very difficult. Early operation is indicated in either case because of the danger of intracranial complications.

WEINGÄRTNER (48, **Orbital abscess with panophthalmitis**) reports an acute case of this nature. The X-ray showed obscuration of the frontal sinus; this was found unaffected at operation, the trouble being a deep abscess of the orbit.

WICK (50, **Bilateral phlegmon of the orbit and thrombosis of the cavernous sinus**) reports a case of this nature which developed from an unknown origin in a woman 28 years old. The orbits were exenterated at once, but death followed in 78 hours. The accessory sinuses were normal. The clinical diagnosis was confirmed by autopsy. All portions of the eye, and the cellular tissue of the orbit were densely infiltrated with round cells with staphylococci. Autopsy showed a great toxic poisoning of the body but did not reveal the cause.

VIII.—THE CONJUNCTIVA AND CORNEA.

51. BIRCH-HIRSCHFELD. **Treatment of inflammatory diseases of the cornea, especially of ulcus serpens, with ultraviolet light.** *Zeitschr. f. Augenheilkunde*, xliv.

52. BLASKOVICS. **Tattooing of the cornea with candle soot.** *Klin. Monatsbl. f. Augenheilkunde*, lxv., p. 78.

53. ENROTH. **Parenchymatous keratitis and the constitution.** *Ibid.*, lxv., p. 266.

54. FLECK, H. K. **Disciform keratitis secondary to smallpox.** *American Journal of Ophthalmology*, August, 1921.

55. JUNIUS. **Modern views concerning herpes zoster.** *Zeitschrift f. Augenheilkunde*, xliv., p. 74.

56. KUNZE. **Anatomical examination of a case of parenchymatous keratitis due to hereditary syphilis.** *Archiv f. Ophthalm.*, cii., p. 4.

57. LAUTERSTEIN. **Hypopyon after luetin reaction in parenchymatous keratitis.** *Ophthalmic Society in Vienna*, June 21, 1920.

58. MEESMANN. **Pigmentation of the limbus corneæ in Addison's disease.** *Klin. Monatsbl. f. Augenheilk.*, lxv., p. 316.

59. NOVAK. **Symmetrical lipodermoids on both eyes.** *Ophthalmic Society of Vienna*, June 21, 1920.

60. SIEGRIST. **Typical ulcus rodens corneæ following a hordeolum cured by zinciontophoresis.** *Klin. Monatsbl. f. Augenheilk*, lxv., p. 107.

61. SNELL, A. C. **Metastatic infiltration of cornea.** *American Journal of Ophthalmology*, June, 1921.

62. STOCKER. **The infectious nature of febrile herpes corneæl.** *Klin. Monatsbl. f. Augenheilkunde*, lxv., p. 298.

The 10-year-old patient of NOVAK (59, **Symmetrical lipodermoids on both eyes**) presented numerous congenital developmental faults, such as excessive dolichocephalus, nævi with differently colored hair on the scalp, and a large superficial nævus verucosus pigmentosus on the left cheek. Both eyes protruded slightly. At the limbus on the temporal side in the right eye, on the nasal in the left, was a lipodermoid as large

as a pea, which extended into the cornea somewhat. Beneath the conjunctiva of both eyes were large, lobed, reddish yellow, soft tumor masses that extended temporally to the outer canthus and could be followed far back into the orbit. An opacity extended down from above quite a distance into the cornea. The eyeballs were plainly pressed somewhat downward and their motility upward was a little impaired. Both pupils were displaced upward, there was partial ectropion of the pigment layer, and in the fundus could be seen a coloboma of the choroid.

MEESMANN (58, **Pigmentation of the limbus corneæ in Addison's disease**) describes a case of Addison's disease in a woman 31 years old in which, in addition to the frequently described pigmentation of the conjunctiva, the cornea was involved at the limbus. With the naked eye could be seen on each side an almost perfect ring, uniformly brownish black in color, about *2mm* broad, occupying the limbus and extending for about half its breadth over the cornea. A distinct radiating striation of the ring could be seen with a weak enlargement, while with a stronger enlargement and the slit lamp the pigmentation of the conjunctiva became resolved into distinct spots with indistinct margins. The surface of the epithelium appeared to be intact, the pigment confined to the conjunctiva in all its layers, leaving the episclera free. In well marked spots there appeared a many branched and anastomosing canal system, its margins sharply defined by pigment. The limbus ring corresponded essentially in its arrangement to the pigmentation of the conjunctiva.

ENROTH'S (53, **Parenchymatous keratitis and the constitution**) studies of fifteen cases of diffuse parenchymatous keratitis showed that congenital syphilis was unquestionably present in thirteen, and that this disease was excluded with certainty in one, with probability in another. Tuberculosis was probably present in three, possibly in four others. In ten disturbances of the internal secretions could be demonstrated as very probable, while the others presented symptoms which might be regarded as endocrine. Six of the ten had clinical symptoms of status thymicolymphaticus and gave a positive Abderhalden reaction with thymus. In all of these cases there were at the same time present disturbances of other internal secre-

tions, such as in the function of the thyroid in two cases, of the thyroid and the sexual glands in one, the thyroid and the suprarenal capsules in one, the sexual glands and the hypophysis in one, and the spleen in one. In part these disturbances were demonstrated clinically and serologically, in part only serologically. In two cases a positive Abderhalden reaction was obtained only with thyroid, in two only with sexual glands; these cases showed also clinical disturbances referable to the organs in question. All the patients presented degenerative stigmata, some a number of them.

Without going deeply into the literature KUNZE (56, **Anatomical examination of a case of parenchymatous keratitis due to hereditary syphilis**) compares his findings in a pair of eyes with parenchymatous keratitis taken from a 12-year-old girl who had hereditary syphilis, with those of former writers. The epithelium showed a disturbance in the form and arrangement of the cells, a progressive thinning and final perforation, and a round cell infiltration. Most former observers found accumulations of round cells and changes in the epithelium. Splitting up or destruction of Bowman's membrane at some places, and its replacement in places by cellular tissue with elongated cells and vessels and a round cell infiltration are like what has already been described. Corresponding to the altered places in Bowman's membrane the propria and the epithelium frequently present an infiltration of round cells and a new formation of vessels. The anterior and the posterior layer of the parenchyma are involved in the pathological process, and the third of the cornea next to the limbus is more affected than the central third. The round cell infiltration is the most marked change, newly formed vessels may or may not be present. Part of the vessels are large, enclosed in strong walls, or free from round cell infiltration, while others are without walls, simply lined with endothelium; such without lumen are rare and may perhaps be regarded as undergoing involution. The lumina of the vessels in the scleral band are open, so that here almost nothing of obliterating processes can be found. This condition controverts the theory formerly held that the parenchymatous process in the cornea is due to obliteration of the pericorneal vascular plexus. Descemet's membrane is split and broken up, as found by others; this he explains as due

to cicatricial change of the posterior surface of the cornea. Whether the folding of Descemet's membrane described also in other cases may not be at least partially an artificial product, remains an open question. The changes in the endothelium are only slight, but a cellular infiltration can be recognized in the angle of the anterior chamber; a giant cell formation which can be followed over several sections shows conditions quite analogous to those described by Elschnig. Hippel also has observed giant cells in the angle of the anterior chamber as well as in the propria and Descemet's membrane, and Stähli has described a giant cell formation in the sparsely vascularized tissue of the angle of the anterior chamber. As typical as the infiltration of lymphocytes in the iris and ciliary body are many chorioretinitic foci of lymphocytes and epitheloid cells which show a tubercyloid construction quite similar to that portrayed by v. Hippel and Igersheimer. Part of the manifold other changes in the choroid and retina are old cicatricial processes, part are more fresh. A search for spirochætæ in an excised piece of the cornea, stained by Levaditi's method, failed.

Hypopyon followed a luetin reaction in a child 4½ years old with parenchymatous keratitis, according to LAUTERSTEIN (57, **Hypopyon after luetin reaction in parenchymatous keratitis**). A causal connection is assumed. Treatment of parenchymatous keratitis with luetin proved a failure in Meller's clinic, but for diagnostic purposes the luetin reaction is very valuable. Out of nine cases it proved positive in eight and uncertain in one. Its employment is recommended in all cases, as it may be positive even when the Wassermann is negative.

FLECK (54, **Disciform keratitis secondary to smallpox**) observed a case of disciform keratitis which followed the removal of a foreign body in a patient who was in the first stage of smallpox. It is probable that the abrasion was infected from pustules which formed on the conjunctiva.

ALLING.

After thoroughly cleansing the eye of a patient suffering from febrile herpes corneæ, as well as the eye of a rabbit about to be inoculated, STOCKER (62, **Infectious nature of febrile herpes corneæ**) took some material from the diseased human

cornea with a sterile cataract knife and made with the same knife laden with the material for inoculation two or three parallel incisions into the cornea of the rabbit and rubbed in the material with the flat of the blade. The result was a keratitis in the rabbit very similar to that in the human eye. This experiment was repeated with material from five different patients with the same result each time. Control experiments showed that the result was not due simply to the traumatism and cocainization; that it was not due to the foreign albumin of the inoculated human corneal epithelium, and that the cause of the corneal disease in the rabbit was not a virus contained in any ulcer of the cornea, or one not specific for febrile herpes corneæ. Another evidence of the specificity of the inoculated keratitis is that the typical disease could be transferred from the cornea of one rabbit to that of another, and from the second to a third. Simple rubbing of the inoculation material into the conjunctival sac, without incising the cornea, suffices to convey the herpes, but then the time of incubation is several days longer. The disease is best treated with such antiseptics as tincture of iodine and zinciontophoresis.

JUNIUS (55, **Modern views concerning herpes zoster**) makes the following points: 1. On the basis of the classification now accepted by neurologists herpes zoster ophthalmicus belongs for the most part in the group of secondary zosters. The causes of the primary disease are not always the same. The fundamental disease itself may already have been completely cured, and only a predisposition to nerve disturbance be left. Recurrence of the disease after a long interval has been observed. 2. Although a traumatic origin of herpes zoster ophthalmicus has not yet been established scientifically, sometimes in practice a connection between corneal traumatism and herpes corneæ must be regarded as not impossible. 3. Possibly there is a herpes zoster ophthalmicus which is caused not through neuritis or disease of the nerve ganglia, but through a disturbance in the higher sensory centers of the trigeminus in the medulla oblongata. 4. Zosters occur on the eye with such rare complications as exophthalmos, or eruptions of blebs on the sclera, described as zoster of the ciliary nerves. 5. The connection of herpes zoster ophthalmicus with such other affections as keratitis neuroparalytica and ulcus corneæ rodens

receives no further elucidation. Whether keratitis disciformis and other neuropathic diseases of the cornea have such connection should be investigated. 6. The essential factor in all these affections is a reduced vitality of the cornea. Necrosis is anatomically demonstrated in ulcus rodens, the same is true of zoster uveæ. 7. As regards treatment, irritant remedies are certainly not always ineffective, but their healing power can rest only on an alterative action. Caustics and cauterization are to be avoided in such high grade nutritive disturbances as are present in ulcus rodens corneæ.

SIEGRIST (60, **Typical ulcus rodens corneæ following a hordeolum cured by zinciontophoresis**) reports a case in which a single application of zinciontophoresis proved efficient after all other therapeutic measures had failed. He used a solution of zinc sulphate and a current of two milliamperes for 2 minutes.

SNELL (61, **Metastatic infiltration of cornea**) observed a man who had been severely burned over his entire body and developed on the ninth day a ring ulcer of the left eye which completely encircled the cornea and was speedily followed by panophthalmitis. The right cornea soon began to show signs of breaking down and the ulceration spread about one third the way about the circumference. After the rupture of Descemet's membrane the process made no further progress. The right eye recovered with fair vision. He regards the affection of the eyes as metastatic since the patient was toxic from infection from the numerous burns which were discharging pus.

ALLING.

BIRCH-HIRSCHFELD (51, **Treatment of inflammatory diseases of the cornea, especially ulcus serpens, with ultraviolet light**) confirms the observations of Hertel that ultraviolet light is a good means for the treatment of serpiginous ulcer and other inflammatory diseases of the cornea. He uses a small electric light with a quartz lens of 20 dioptres and a uviol glass in front of it. With another quartz lens, held between the thumb and forefinger, he focusses the rays upon the margins of the ulcer. The light used dazzles but little and induces no pain or feeling of heat after prolonged exposure, because most of the dazzling rays are disposed of by the uviol glass. A total of 43 pneumococcal ulcers were thus treated in a year and a half. In 33, which were healed by the irradiation alone, the

functional results were very good. The number of times irradiation was necessary varied. The individual irradiations were from 1 to 5 minutes, the average total time of irradiation was 39 minutes, the average duration of treatment was 12 days. The shortest time needed for a perfect result was a total of 8 or 9 minutes of irradiation, the longest 110 minutes in the course of 27 days. The determination of the dose for the individual case must be learned through practice. One may begin with sittings of five minutes each twice a day, and, after cleaning of the progressive margin, reduce the dose to a daily sitting of five minutes. If the epithelium has been regenerated, as after abrasion in cases of superficial keratitis, so that staining with fluorescin is no longer possible, the length of the irradiation must be increased, but not to the point of a harmful dose.

BLASKOVICS (52, **Tattooing of the cornea with candle soot**) shaves off the epithelium of the area to be tattooed and then scarifies the tissue with the knife held obliquely so that several layers of tissue lie one above another. The oblique position of the knife permits deep incisions without danger of perforation. It is important that a chemically indifferent and sterile coloring matter be used, and this he obtains in the soot from a candle. This he obtains by holding a perfectly clean slide over an ordinary candle and allowing it to blacken without letting the glass touch the wick. After the tattooing has been done he applies a dry dressing and bandage. There is almost no reaction. In ten or twelve cases treated in this way a bandage was necessary for only two or three days at most. In all cases the tattooed spot on the cornea was made intensely black at one sitting, and no infection was observed. A histological examination of a tattooed cornea which was accidentally made possible a few weeks after the tattooing had been done, showed that there had been a total absence of reaction to the operation. Beneath the epithelium were scattered grains of soot, while in the cicatricial tissue they were gathered together in masses. There was no cellular infiltration worth mention.

IX.—THE PUPILS.

63. FRIEDENTHAL. **A case of perverse convergence reaction of the left pupil.** *Deutsche med. Wochenschrift*, 1920, p. 929.

64. JUNIUS. **Can influenza cause reflex immobility of the pupils?** *Zeitschrift f. Augenheilkunde.*, xliv, 1920.

65. LÖWENSTEIN. **Contribution to the study of katatonic pupillary changes.** *Monatschrift f. Psych. u Neurol.*, 1920, xlvii., p. 194.

66. WILSON, S. A. KINNIER. **The Argyll-Robertson pupil.** *Journal of Neurology and Psychopathology*, May, 1921.

FRIEDENTHAL (63, **Perverse convergence reaction**) reports a case of this nature met with in a syphilitic patient. Visual trouble had been corrected by glasses. The visual field and the motility of the eyeballs were normal. The right pupil was larger than the left; neither reacted to light. The right pupil contracted slowly in convergence, while the left dilated after a transient normal contraction. The fundus was normal. Neurological examination revealed nothing in particular aside from a weakening of the patellar reflex. Wassermann positive. The monolateral appearance of the perverse convergence reaction seems noteworthy.

WILSON (66, **The Argyll-Robertson pupil**) says that the condition of the pupil which constitutes the true Argyll-Robertson pupil is one in which there is an absence of the direct reflex to light—the consensual reflex being either present or absent—with preservation of the pupillary reaction on convergence-accommodation.

Myosis is not necessarily associated with the reflex and irregularity or inequality of the pupils is merely incidental.

The Argyll-Robertson sign is so commonly associated with neurosyphilis that the fact, that conditions definitely non-syphilitic can produce the condition, is often overlooked.

In this paper Wilson quotes cases of different conditions in which the sign was present and endeavors to produce anatomical evidence for a nervous mechanism directly associated with the sign.

Regarding the different conditions in which the Argyll-Robertson sign may be present; it has been found in epidemic encephalitis, in disseminated sclerosis, in cases of cerebral tumor in the vicinity of the third ventricle aqueduct or superior corpora quadrigemina in these cases together with the Argyll-Robertson sign there was paralysis of conjugate upward movement—in syringomyelia, in chronic alcoholism, and in trauma either to the eye or brain.

Wilson asserts that the sign can remain as a "scar" long after the active mischief has ceased and in consequence its prognostic value is of no great account.

It must be admitted that there is a physiological differentiation for reflex impulses as opposed to visual impulses. This differentiation has been substantiated: (1) by the presence of thick and thin fibers in the optic nerve; (2) by the presence of single and multiple combinations in the retina of ganglion cells with bipolar cells and rods and cones; also the relation between visual loss and reflex loss is not constant.

Wilson favors the view that the superior colliculus is an important station in the reflex arc, notwithstanding experiments in which this region has been destroyed without interference with the light reflex, as in these experiments it was doubtful if complete destruction had been effected.

He traces the light reflex fibers, after a partial decussation in the chiasma, to the superior colliculus via the superior bracchium. Here they end and the reflex arc is continued on by the colliculo-nuclear tract, which passes around the wall of the aqueduct and which partially decussates, to the region of the oculomotor nuclei. These fibers may either end in the anterior end of the oculomotor nucleus or passing by, without forming connections, join the third nerve root and so on to the ciliary ganglion as preganglionic fibers.

Wilson does not credit the Edinger-Westphal nucleus as the iris-constricting center because this nucleus is not recognizable until the seventh month of fœtal life whereas it has been shown that the pupil reacts to light by the end of the fifth month and further in some cases of fixity of the pupil to light no pathological changes have been found in the nucleus.

Regarding the path for convergence and accommodation; this is an associated movement and as such must be represented in the cortex, the details of the act being coördinated at the nuclear level.

Wilson favors a situation at the junction of the second frontal and precentral gyri, near to the known center for conjugate lateral movements, and traces the efferent connections with the oculomotor nuclei via the genu of the internal capsule to the crus cerebri whence the nuclear fibers pass

dorsally by the pes lemnisci profundus through the fillet to the nuclei of the ocular muscles.

Tumors in the neighborhood of the superior colliculus produce the Argyll-Robertson pupil and it is probable that a lesion in this situation is the commonest cause for the Argyll-Robertson sign, excepting those cases due to traumatism where the lesion is almost certainly nearer to the eyeball along the afferent tract.

The lesion in the Argyll-Robertson pupil is on the afferent side of the light reflex arc and the syphilitic toxin has a particular affinity for afferent systems and afferent terminal arborizations. To explain the great frequency of the Argyll-Robertson sign in neuro-syphilis, Wilson suggests that toxins from the infected cerebrospinal fluid spread through the subependymal tissues surrounding the aqueduct and attack the colliculo-nuclear fibers in this situation.

Regarding the frequent associated myosis; statistics show that this is present in 30 per cent. of cases of Argyll-Robertson pupil. Dilatation of the pupil can occur when the usual dilator tract is out of order. This is explained in the following way. There is a cortical center which has an inhibitory effect upon the tone of the constrictor center in the oculomotor group. It is probable that the fibers from this inhibitory center pass by peri-aqueductal lines to the oculomotor nuclei and consequently would be affected by the toxin which is affecting the afferent fibers of the pupil reflex arc. The consequent result being myosis owing to the unrestrained action of the constrictor center. This theory is supported by the fact that the Argyll-Robertson pupil does not dilate to emotional stimuli.

P. G. Doyne.

Junius (64, **Can influenza cause reflex immobility of the pupils?**) reports a case of reflex immobility of the pupils, slight anisocoria, slight weakness of the accommodation, and distinct paleness of the papillæ which could not be pronounced pathological from the fundus findings and the visual field. With plus glasses the man, 25 years old, had good vision for distance and near. The troubles of which he complained, dazzling and poor near vision without glasses, were attributed to a past attack of influenza. He denied having had syphilis and there were no signs of this disease except a positive Wassermann.

The question arises whether the influenza gave origin to the immobility of the pupils, although syphilis seems to be the more probable cause.

The fact that every psychic process is accompanied by changes in the size of the pupil in healthy men escapes general recognition at the present time, but in the healthy it is not always macroscopically perceptible. It is otherwise with those suffering from nervous troubles. LÖWENSTEIN (65, **Katatonic pupillary changes**) presents the following conclusions: 1. The absence of the restlessness of the pupils and the mydriatic katatonic immobility of the pupils have their cause in the same psychic change. 2. Conditions are produced by this change which induce varying degrees of inhibition of the reflex of the pupils to light. 3. Changes in the pupillary diameter and in the conditions of tension of the musculature of the body are not caused by each other, but by motor impressions of the same conditions of consciousness immediately caused by central changes.

X.—THE UVEAL TRACT AND SYMPATHETIC OPHTHALMIA.

67. GILBERT. **Circle of nodules of the ciliary body in erythema nodosum.** *Archiv f. Augenheilkunde*, lxxxvi., p. 50.

68. KADLETZ. **Deposits of lime in the ciliary processes.** *Zeitschrift f. Augenheilkunde*, 1920, xliv., p. 219.

69. KADLETZ. **Detachment of the retina with sarcoma of the choroid.** *Ibid.*, xliv., p. 219.

70. LAUBER. **Unexplained tumor of the choroid.** *Klin. Monatsbl. f. Augenheilkunde*, lxv., p. 423.

71. MELLER. **Anatomical conditions found in both eyes in a case of sympathetic ophthalmia.** *Archiv f. Ophthalmologie*, cii., p. 122.

GILBERT (67, **Circle of nodules of the ciliary body in erythema nodosum**) describes a case in which a ring of reddish gray nodules of varying breadth and arising from the ciliary body were almost everywhere visible in the anterior chamber. Opacities were present in the vitreous and the region of the ciliary body was sensitive to pressure, especially below. A week later the nodules underwent involution. These nodules were similar to the changes in the skin. There were no superficial vessels. There were no grounds for suspecting tuberculosis. The circular arrangement of nodules or tumors of the

ciliary body is rare; usually they occupy only a small part of the circumference.

KADLETZ (68, **Deposits of lime in the ciliary processes**) describes five cases in which such deposits were found. The diseases in which they occurred were one case of endophthalmitis after ulcus serpens, one of commencing atrophy of the globe after cataract extraction, one of necrotic sarcoma of the choroid, and two of sarcoma of another kind. The ciliary processes were in part normal, in part undergoing hyaline degeneration. The lime was found in little lumps, sharply defined and confined to the walls of the blood vessels; in one case it was deposited over the entire area of the processes with sharply defined margins. All of the patients were over 57 years old, so the writer considers this to be a senile phenomenon.

KADLETZ (69, **Detachment of the retina with sarcoma of the choroid**) reports a case of sarcoma of the choroid in which the retina was not detached. The tumor was a non-pigmented, fascicular sarcoma as large as a small pea situated at the upper margin of the papilla, where the intimate attachment of the retina to the optic nerve prevented detachment of the former. The tumor projected 4.3*mm* into the vitreous and was covered by retina, adherent to it. The vitreous membrane of the choroid was broken through. The retina was split into two layers, perhaps because the pressure of the growing tumor was not exerted to the same degree upon the neuro-epithelial layer as upon the layer of nerve fibers.

LAUBER (70, **Unexplained tumor of the choroid**) observed in a woman 65 years old a protrusion 13 diopters high and 5 pupillary diameters in diameter two pupillary diameters below the optic nerve. Its margin was overhanging and in places it was covered by hemorrhages. Transillumination showed no such shadows as are produced by pigmented tumors. He believes it either a gumma or a tuberculous focus without pigment.

MELLER (71, **Anatomical conditions found in both eyes in a case of sympathetic ophthalmia**) reports a case in which a perforating wound of the cornea with prolapse of the iris was followed by increase of tension and ciliary and intercalary staphylomata. The eye was removed at the end of ten months.

Twenty days later a sympathetic inflammation appeared in the other eye and ran a rather mild course. Three months after its outbreak the patient died and the eyes were removed for examination. In the injured eye were unmistakable signs of a sympathy exciting inflammation, especially in the iris. The choroid also contained little foci of lymphocytes which were plainly fresh. The changes in the ciliary body were not specific. Perhaps the specific inflammation had started shortly before the enucleation of the eye. In the second eye the changes were less far advanced, in spite of the three months' duration. No inflammatory changes were visible outside of the eye. Perhaps the foci of lymphocytes correspond to the entrance of active agents, while the subsequent appearances with epithelioid and giant cells seem to be a consequence of the overcoming of the germs by the protective force of the organism, so that they may be connected with the cessation of the clinical symptoms.

(*To be continued*)

BOOK REVIEWS

VIII.—**Medical Ophthalmology**. By R. Foster Moore, Assistant Ophthalmic Surgeon, St. Bartholomew's Hospital, Suregon Moorfields Eye Hospital. 300 pages, 80 illustrations. P. Blakiston Son & Co., Philadelphia, 1922. Price $3.50.

The author, through his interest in this particular field and his opportunities in the medical wards of St. Bartholomew's Hospital, has been able to make many valuable investigations, which in part have appeared before and now are collected in a single volume, together with a review of the subject obtained principally from English and American writers. The changes are considered under the heads of separate diseases; a strict classification is not, however, carried out. While this may add to the readability of the book, omissions have occurred of conditions which seem important to the reviewer, and an uneven treatment of the subject has resulted.

Chapter I contains a description of certain conditions which the author prefers to consider out of their regular order, such as the cortical representation of vision, papilœdema retinal hemorrhages, etc. The chapters on arteriosclerosis and renal disease deserve particular mention and praise. The illustrations, all in black and white, are excellent. An author's index and a general index are added. A. K.

IX.—**Diseases of the Eye.** By C. H. May. 10th edition, 440 pages, with many illustrations. New York, W. Wood & Co., 1922. Price $3.50 net.

Dr. May's well-known text book has received a thorough revision for this new edition. The subject-matter is brought up to date without increasing the size of the volume. It should continue to enjoy the popularity it justly deserves.

A. K.

X.—**Die Krankheiten Des Auges im Zusammenhang mit der inneren Medizin.** Medical Ophthalmology by PROFESSOR L. HEINE, Director of the Eye-Clinic in Kiel. 540 pages, 219 illustrations (many in colors). Berlin, J. Springer, 1921.

Professor Heine, after a long apprenticeship under Uhthoff, has continued his investigations on the relation of eye diseases to general medicine in his twelve years at Kiel, and the result of these many years now appears in book form.

The subject is divided into two parts. In the first the eye symptoms occurring in general diseases are taken up as they appear on objective and subjective examinations, together with directions on how the examinations are made. In the second part the general diseases are taken in turn and in groups, and their characteristic eye symptoms are explained. The possible repetition in the two parts is only of advantage, and many points are thereby made more clear.

A remarkable feature of the book are the excellent illustrations; many of these are in colors, and some of the fundus pictures are given in both the usual light and in the red-free light.

The book contains an enormous amount of valuable information, with many original view points which are of interest without necessarily being convincing.

A. K.

XI.—**Scalae Typographicae.** By Dr. R. BIRKHAEUSER. 2d edition. Basel, E. Birkhaeuser & Co., 1922, franc 10 (Swiss).

These test-types for reading distance are undoubtedly the most exact and the best printed test-types in existence. They contain German, Italian, French and English text, and one page of numbers. They are noteworthy for the clear type, the dull, thick paper, and the convenient book form.

A. K.

Erratum. The illustrations on page 205 (May number) in "Trend in Glaucoma Operations" by Col. H. Herbert are wrongly placed and numbered. They should be placed upside down so that the conjunctival side is up, and fig. 2 applies to the earlier condition and No. 1 to the later.

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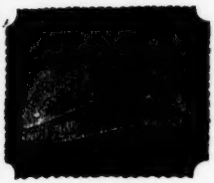

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